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1.0 Introduction

1.1 Project Background

Traffic studies are the initial step of any road project whether it is improvement/upgradation over existing road. This generally considered by way augmentation of existing capacity of road such that, the road would handle the present and future traffic in acceptable level of service. In order to decide upon the type of improvement or upgradation required needs some base line studies related to traffic volume and its composition. These traffic studies are the base for deciding many components such as roadway width, lane width, pavement design etc. All these signify the importance of traffic data. Traffic flow on rural section is different when it is compared with that of an urban road section. In the urban areas, the traffic flow is frequently interrupted with close intersections and continuous ribbon development. When there is a ribbon development is majorly a commercial establishment, this will also affect the through traffic along the corridor due to parking or stopping near commercial establishment. All these conditions warrants for congestion and delay in the traffic flow thereby increase in the travel time leading to unnecessary increase in Vehicle Operation Cost. Presently, the study is under consideration is pertaining to an urban section of an important arterial road in the Bangalore City which has similar type of ground condition and carry maximum volume of passenger vehicles specially Two-Wheelers, Autos and Cars. The road which needs immediate attention is part of Jaya Chamarajendra Road (JC Road) from Minerva Junction to Town Hall Junction and further upto Hudson Circle via Town Hall. It is observed that, there are 5 number of major junctions excluding Minerva Junction and Hudson Circle along the road located at very closely leading to frequent traffic congestion along the JC road.

Therefore, the **Bruhat Bengaluru Mahnagara Palike (BBMP)** has decided to improve the traffic flow along JC road by augmenting the current roadway by adopting Elevated Road from Minerva Junction to Hudson Circle so that the congestion level along JC Road and further up to Hudson Circle may eased to an extent possible.

1.2 Project Description

The project stretch from Minerva Junction to Hudson Circle is about 2.2 Km in length and traverses through following intersections.

(a) **JUNCTION-1:** Minerva Junction (Lalabagh Fort Rpad, RV Road, Sajjan Rao Circle Road, K R Market Road) at Km 0.300

(b) **JUNCTION-2:** JC Road with Armugum Mudaliar Road-Siddaiah Road Junction at Km 0.680

(c) **JUNCTION-3:** JC Road with Shivaji Talkies-Poornima Theatre Junction at Km 1.140

(d) **JUNCTION-4:** Town Hall Junction (JC Road and Nrupathunga Road) at Km 1.440

(e) **JUNCTION-5:** Badami House Junction (JC Road with SP Road and Mission Road) at Km 1.700

(f) **JUNCTION-6:** Halasur Gate Police Station Junction (JC Road with Naganna Road and Raja Ram Mohan Roy Road) at Km 1.80

(g) **JUNCTION-7:** Kempegowda Road (KG Road) Junction (JC Road with Kempegowda Road (KG Road), Nrupathunga Road (NR Road) and Kasturaba Road) at Km 1.92

(h) **JUNCTION-8:** NR Road & RRMR Road Junction (Nrupathunga Road Junction with Rajaram Mohan Roy Road and Devanga Hostel Road Junction) at Hudson Circle

The details of the above junctions have been indicated in location map below.

1.3 Purpose of Traffic Study

Traffic surveys have been carried out on the project corridor in order to identify present and likely future scenarios so as to device suitable remedial measures and to evolve appropriate design method. The primary objectives of these traffic surveys are to determine the characteristics of traffic movement on the project corridor determine the turning movement pattern of traffic at road intersections.

As per the present traffic flow pattern following have been observed;

- The traffic is allowed flow from Minerva Junction to Town Hall in one direction only.
- From Town Hall Junction to Hudson Circle, the traffic is allowed in both direction.
- At all the junctions mentioned above, the traffic flow has been restricted in many directions due high volume of traffic flow. The details of traffic flow are presented in subsequent sections.

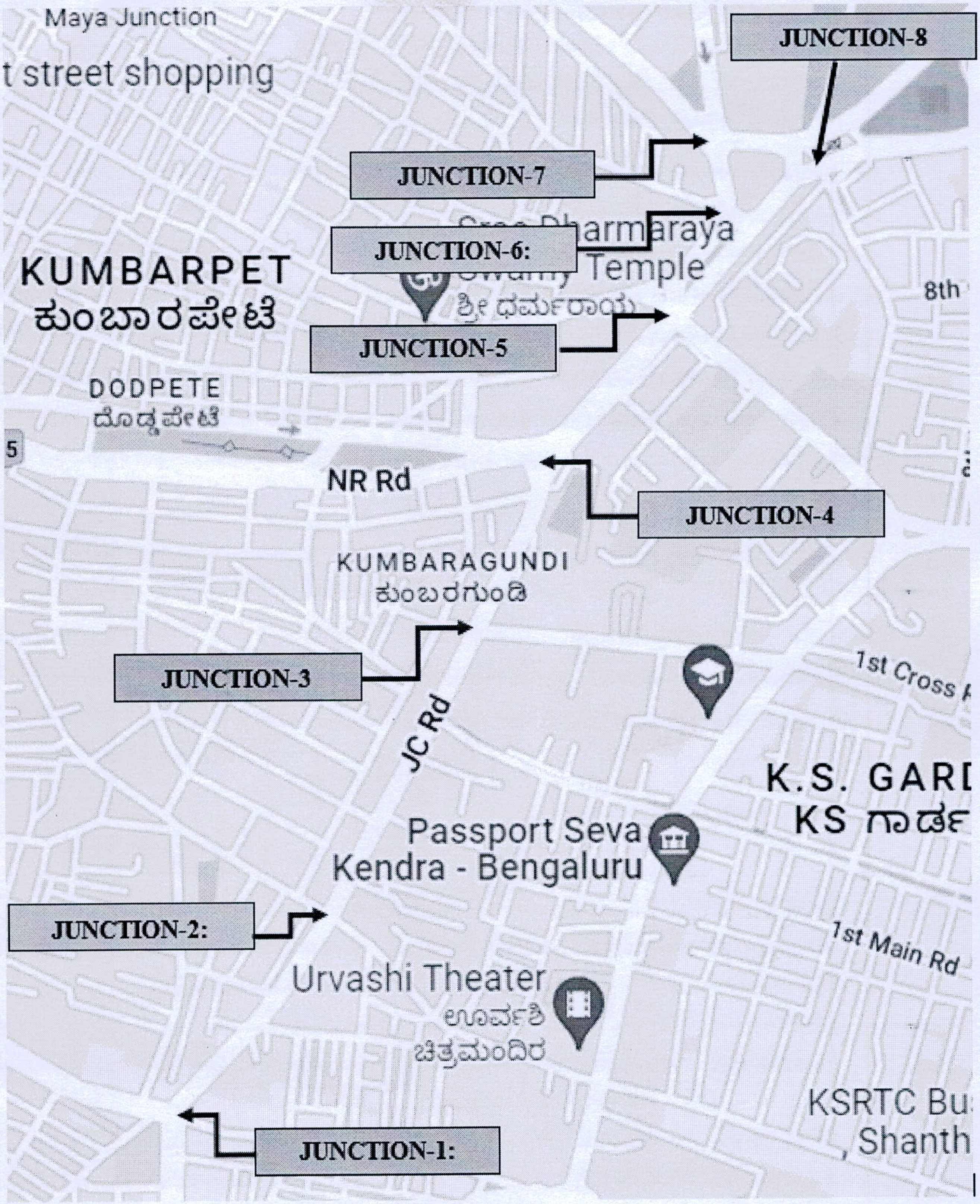


Figure 1-1: Details of Project Stretch

2.0 Traffic Surveys and Analysis

2.1 Traffic Survey

2.1.1 Traffic Survey Locations

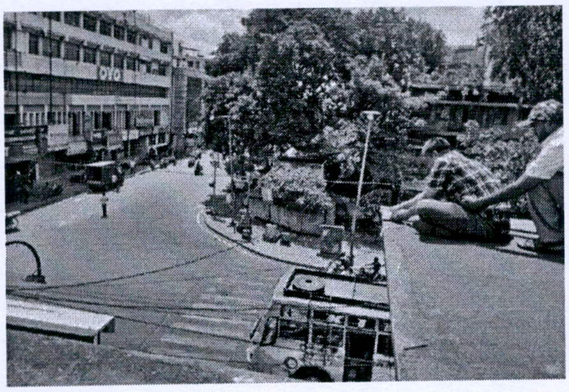
The primary surveys were intended to estimate the traffic scenario on the project corridor and to identify necessary requirements to provide an enhanced facility. In order to make a proper assessment of traffic volume, base year traffic and its projection, Consultants, have carried out the necessary traffic surveys and investigations. The base year traffic data is the primary input for determination of future traffic demand. With a view to estimate the base year traffic volume, the Classified Turning Traffic Volume Count (CTTVC) Survey at all the above mentioned junction locations have been conducted. In addition to this, a sample Origin and Destination survey to assess the travel characteristics Minerva Junction and Hudson Circle have been carried out.

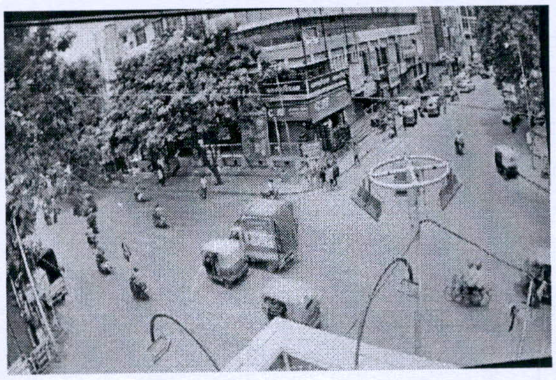
The traffic survey locations are selected based on a detailed reconnaissance survey. All the traffic surveys and further analysis is carried out as per the guidelines given in IRC: SP 19-2001, IRC: 108-1996, IRC SP: 41-1994, IRC: 102-1988 and IRC: 09-1972. The traffic volume count survey was conducted during morning peak and evening peak to ascertain the peak hour traffic flow at all these junctions on normal working days from Wednesday to Friday for 3 days.

Table 2-1: Traffic Survey Locations

No	Name of Junctions	Remarks
1	**JUNCTION-1:** Minerva Junction (Lalabagh Fort Rpad, RV Road, Sajjan Rao Circle Road, K R Market Road)	• It is Five Leg Junction. • Presently allowed for 6 major directional traffic flow at junction.
2	**JUNCTION-2:** JC Road with Armugum Mudaliar Road-Siddaiah Road Junction	• It is Four Leg Junction. • Presently allowed for 4 major directional traffic flow at junction.
3	**JUNCTION-3:** JC Road with Shivaji Talkies-Poornima Theatre Junction	• It is Four Leg Junction. • Presently allowed for 6 major directional traffic flow at junction.
4	**JUNCTION-4:** Town Hall Junction (JC Road and Nrupathunga Road)	• It is Three Leg Junction. • Presently allowed for 4 major directional

No	Name of Junctions	Remarks
		traffic flow at junction.
5	**JUNCTION-5:** Badami House Junction (JC Road with SP Road and Mission Road)	• It is Four Leg Junction. • Presently allowed for 4 major directional traffic flow at junction.
6	**JUNCTION-6:** Halasur Gate Police Station Junction (JC Road with Naganna Road and Raja Ram Mohan Roy Road)	• It is Four Leg Junction. • Presently allowed for 4 major directional traffic flow at junction.
7	**JUNCTION-7:** Kempegowda Road (KG Road) Junction (JC Road with Kempegowda Road (KG Road), Nrupathunga Road and Kasturaba Road)	• It is Four Leg Junction. • Presently allowed for 3 major directional traffic flow at junction.
8	**JUNCTION-8:** NR Road & RRMR Road Junction (Nrupathunga Road Junction with Rajaram Mohan Roy Road and Devanga Hostel Road Junction) at Hudson Circle	• It is Four Leg Junction. • Presently allowed for 3 major directional traffic flow at junction.





2.1.2 Passenger Car Units (PCU) For Analysis

All the vehicles need to be converted into common unit. Therefore, as per the guidelines of IRC, the PCU factors as per the recommendations of IRC-106: 1990 were adopted in converting no. of vehicles to PCU since the present stretch of road under study is pertaining to urban area. The PCU values for each type of vehicles are presented in table below.

Table 2-2: PCU Values for Analysis

Vehicles	PCU Values upto 5% Composition	PCU Values above 5% Composition
2 Wheelers	0.5	0.75
Auto Rickshaw	1.2	2
Car/Jeep/Van/Taxi	1.0	1.0
Mini Bus	1.4	2.0
Standard Bus	2.2	3.7
LCV	1.4	2.0
2 Axle Trucks	2.2	3.7
3 Axle Trucks	4.0	5.0
MAVs	4.0	5.0
Tractor With Trailer	4.0	5.0
Tractor Without Trailer	4.0	5.0
Cycle	0.4	0.5
Bullock Cart	1.5	2.0
Horse Drawn Vehicle	1.5	2.0
Hand Drawn Vehicle	2.0	3.0

2.2 Classified Turning Traffic Survey Data Analysis for Junctions

The classified turning traffic volume counts were conducted at eight intersection locations during the peak hours of the normal working days from Wednesday to Friday i.e. from 17/08/2022 to 19/08/2022 to evaluate variation in the peak hour traffic on different days of the week. For the purpose of present study, peak hours have been categorised Morning Peak Hour based on Morning Peak Period from 09.00 am to 12.00 pm and Evening Peak Hour based on Evening Peak Period from 04.00 4m to 07.00 pm.

The detailed analysis of the present traffic data for all the eight junction locations are summarized in terms of Peak hour traffic volume, directional distribution, composition etc.

2.2.1 Minerva Junction

Minerva Junction is a Five leg junction and presently has restricted directional movements at the junction. As per the present traffic flow, following are the directions allowed for traffic movement.

- Lalbagh Fort Road to JC Road
- Lalbagh Fort Road to K R Market.
- RV Road to JC Road
- Sajjan Rao Circle (Diagonal Road) to JC Road
- K R Market to JC Road
- K R Market to R V Road

Based on these traffic flow at the junction, the data collected for the three days has been averaged and summary of the data analysis are presented below for the junction.

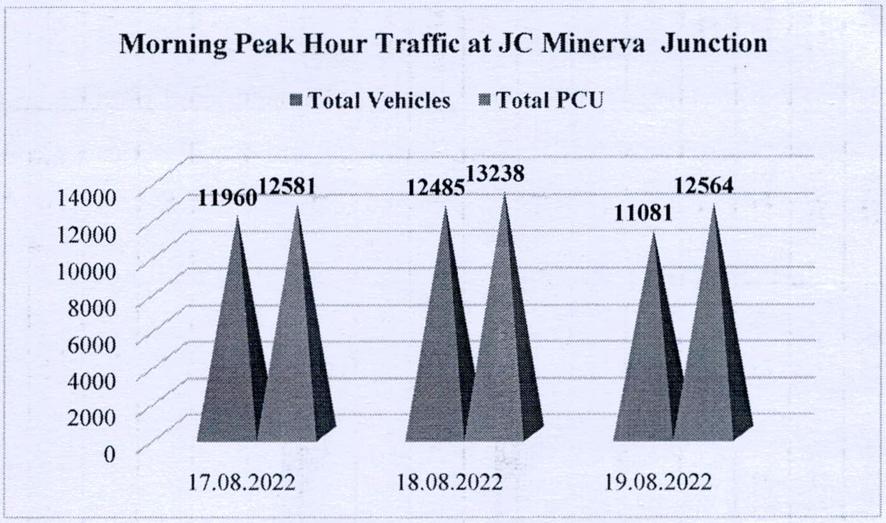
Summary of three days Morning Peak Hour and Evening Peak Hours are presented below.

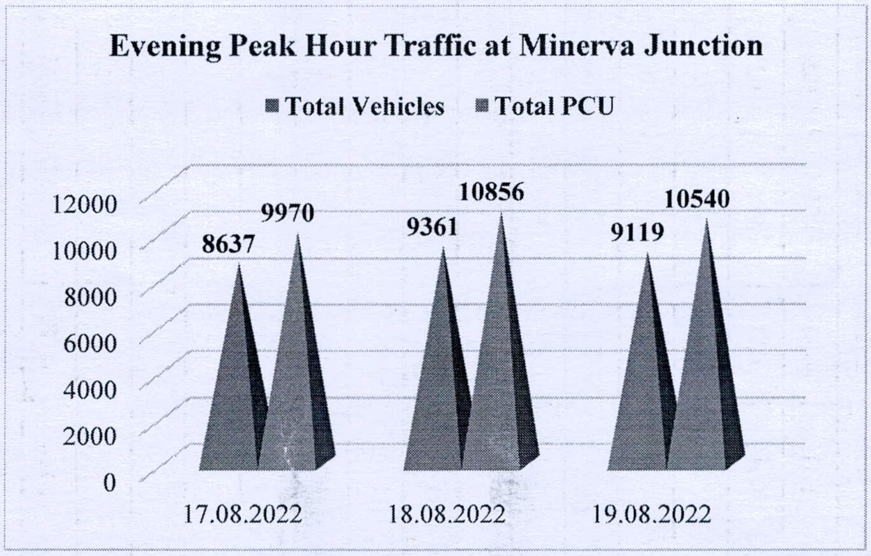
Table 2-3: 3 Days Morning Peak Hour Traffic at Minerva Junction

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	10.00am to 11.00am	11960	12581
18.08.2022	10.00am to 11.00am	12485	13238
19.08.2022	11.00am to 12.00pm	11081	12564
Average of 17.08.2022 to 19.08.2022	**10.00am to 11.00am**	**12094**	**12760**

Table 2-4: 3 Days Evening Peak Hour Traffic at Minerva Junction

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	04.00pm to 05.00pm	8637	9970
18.08.2022	04.00pm to 05.00pm	9361	10856
19.08.2022	04.00pm to 05.00pm	9119	10540
Average of 17.08.2022 to 19.08.2022	**04.00pm to 05.00pm**	**9039**	**10455**





Detailed Peak hour traffic details including, directional flow, vehicle types, composition, percentage of directional flow are presented in both tables and graphical representation for ready reference below for both morning peak and evening peak hours.

Table 2-5: Summary of Morning Peak Hour Traffic at Minerva Junction

	Vehicles	**D-1 to D-4**	**D-1 to D-5**	**Total Traffic from D-1**	**D-2 to D-5**	**Total Traffic from D-2**	**D-3 to D-5**	**Total Traffic from D-3**	**D-4 to D-2**	**D-4 to D-5**	**Total Traffic from D-4**	**Total from All Directions**	**Composition of Vehicles**
FAST MOVING VEHICLES	**2 Wheelers**	754	788	**1542**	1738	**1738**	2862	**2862**	200	937	**1137**	**7279**	**60.18%**
	Auto Rickshaw	340	258	**599**	502	**502**	480	**480**	105	394	**499**	**2080**	**17.20%**
	Car/Jeep/Van	264	221	**485**	706	**706**	684	**684**	62	336	**398**	**2273**	**18.79%**
	Min-Bus	11	4	**15**	6	**6**	4	**4**	2	7	**9**	**34**	**0.28%**
	Std. Bus	25	95	**120**	15	**15**	9	**9**	0	93	**93**	**237**	**1.96%**
	LCV	41	28	**69**	18	**18**	24	**24**	5	26	**31**	**142**	**1.17%**
	2 Axle Trucks	17	8	**25**	8	**8**	5	**5**	0	2	**2**	**39**	**0.33%**
	3 Axle Trucks	0	0	**0**	1	**1**	0	**0**	0	1	**1**	**2**	**0.01%**
	MAVs	0	0	**0**	0	**0**	0	**0**	0	0	**0**	**0**	**0.00%**
	Tractor With Trailer	0	0	**0**	0	**0**	1	**1**	0	0	**0**	**1**	**0.01%**
	Tractor Without Trailer	0	0	**0**	0	**0**	0	**0**	0	0	**0**	**0**	**0.00%**
SLOW MOVING VEHICLES	**Cycle**	2	0	**2**	1	**1**	2	**2**	2	2	**3**	**8**	**0.07%**
	Bullock Cart	0	0	**0**	0	**0**	0	**0**	0	0	**0**	**0**	**0.00%**
	Horse Drawn Vehicle	0	0	**0**	0	**0**	0	**0**	0	0	**0**	**0**	**0.00%**
	Hand Drawn Vehicle	0	0	**0**	0	**0**	0	**0**	0	0	**0**	**0**	**0.00%**
Total Vehicles		**1454**	**1403**	**2857**	**2994**	**2994**	**4070**	**4070**	**375**	**1798**	**2173**	**12094**	**100.00%**
Total PCU		**1675**	**1601**	**3276**	**3100**	**3100**	**3864**	**3864**	**433**	**2087**	**2520**	**12760**	
Directional Distribution		**12.0%**	**11.6%**	**23.6%**	**24.8%**	**24.8%**	**33.7%**	**33.7%**	**3.1%**	**14.9%**	**18.0%**	**100.0%**	

Table 2-6: Summary of Evening Peak Hour Traffic at Minerva Junction

	Vehicles	D-1 to D-4	D-1 to D-5	Total Traffic from D-1	D-2 to D-5	Total Traffic from D-2	D-3 to D-5	Total Traffic from D-3	D-4 to D-2	D-4 to D-5	Total Traffic from D-4	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	**2 Wheelers**	523	644	**1167**	1100	**1100**	988	**988**	163	745	**908**	**4163**	46.06%
	Auto Rickshaw	243	348	**591**	600	**600**	326	**326**	98	413	**511**	**2028**	22.44%
	Car/Jeep/Van	389	270	**659**	570	**570**	492	**492**	110	470	**580**	**2302**	25.46%
	Min-Bus	11	5	**16**	8	**8**	5	**5**	0	12	**12**	**41**	0.45%
	Std. Bus	20	111	**131**	17	**17**	10	**10**	0	85	**85**	**242**	2.68%
	LCV	43	46	**89**	28	**28**	18	**18**	7	71	**78**	**213**	2.36%
	2 Axle Trucks	17	8	**25**	6	**6**	3	**3**	0	1	**1**	**35**	0.39%
	3 Axle Trucks	0	0	**0**	0	**0**	0	**0**	0	0	**0**	**0**	0.00%
	MAVs	0	0	**0**	0	**0**	0	**0**	0	0	**0**	**0**	0.00%
	Tractor With Trailer	0	0	**0**	0	**0**	0	**0**	0	1	**1**	**1**	0.01%
	Tractor Without Trailer	0	0	**0**	0	**0**	0	**0**	0	0	**0**	**0**	0.00%
SLOW MOVING VEHICLES	**Cycle**	1	0	**1**	2	**2**	2	**2**	5	4	**9**	**14**	0.15%
	Bullock Cart	0	0	**0**	0	**0**	0	**0**	0	0	**0**	**0**	0.00%
	Horse Drawn Vehicle	0	0	**0**	0	**0**	0	**0**	0	0	**0**	**0**	0.00%
	Hand Drawn Vehicle	0	0	**0**	0	**0**	0	**0**	0	0	**0**	**0**	0.00%
Total Vehicles		**1247**	**1431**	**2679**	**2332**	**2332**	**1844**	**1844**	**383**	**1802**	**2185**	**9039**	**100.00%**
Total PCU		**1425**	**1781**	**3206**	**2697**	**2697**	**1946**	**1946**	**440**	**2166**	**2606**	**10455**	
Directional Distribution		**13.8%**	**15.8%**	**29.6%**	**25.8%**	**25.8%**	**20.4%**	**20.4%**	**4.2%**	**19.9%**	**24.2%**	**100.0%**	

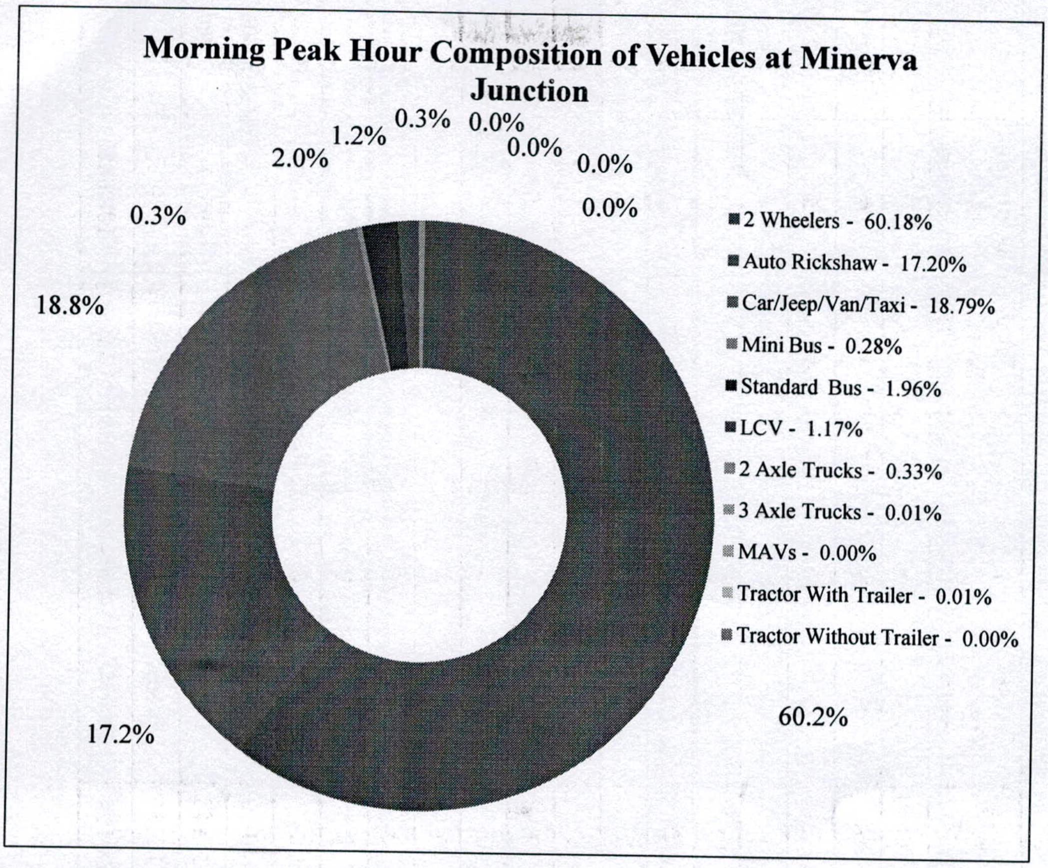


Figure 2-1: Morning Peak Hour Composition at Minerva Junction

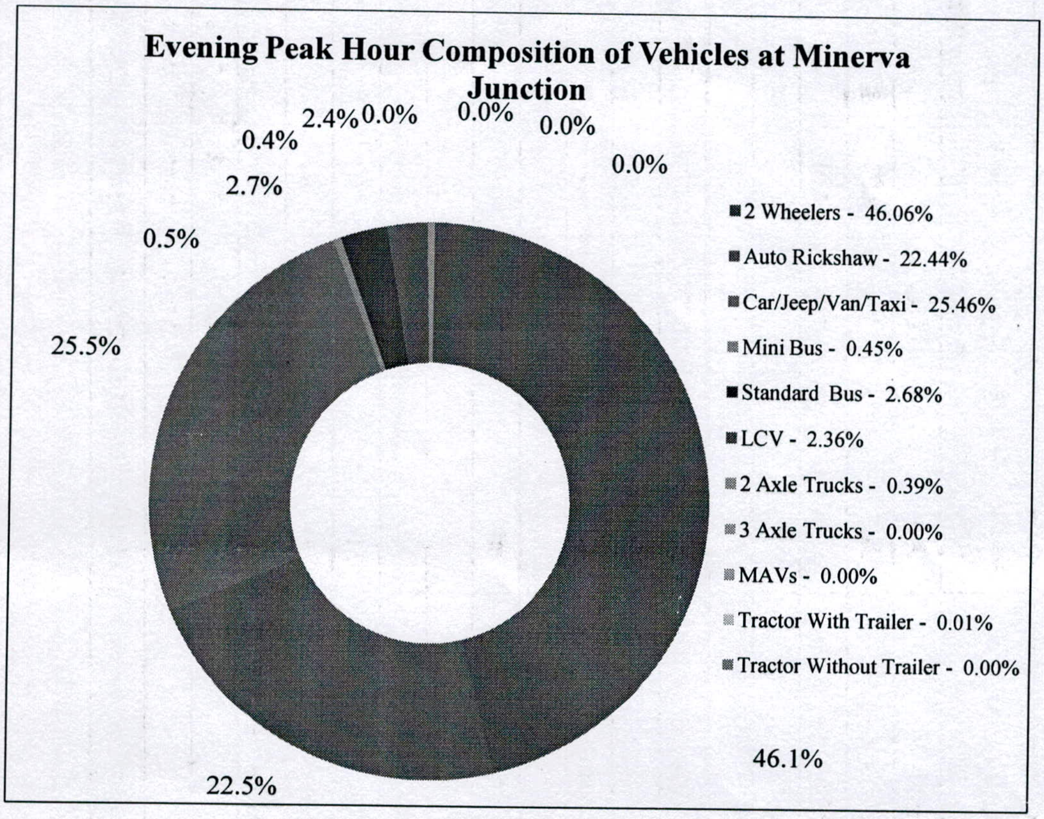


Figure 2-2: Evening Peak Hour Composition at Minerva Junction

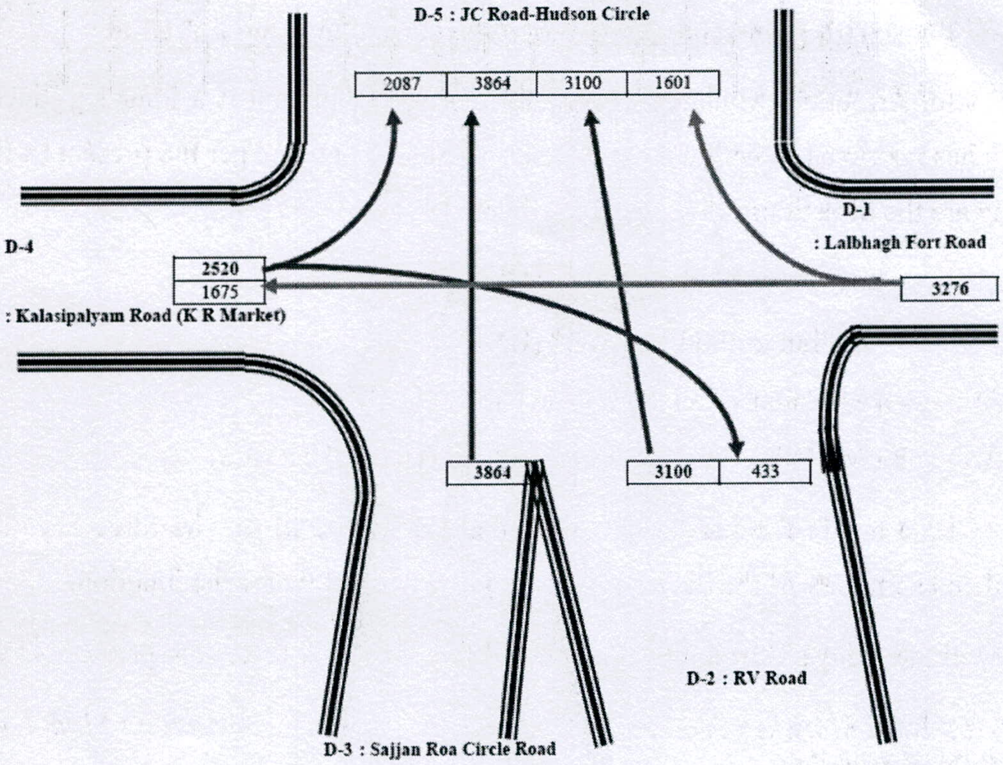

D-5 : JC Road-Hudson Circle
2087
3864
3100
1601
D-1
: Lalbhagh Fort Road
3276
D-4
2520
1675
: Kalasipalyam Road (K R Market)
3864
3100
433
D-2 : RV Road
D-3 : Sajjan Roa Circle Road

Figure 2-3: Morning Peak Hour Traffic Flow at Minerva Junction

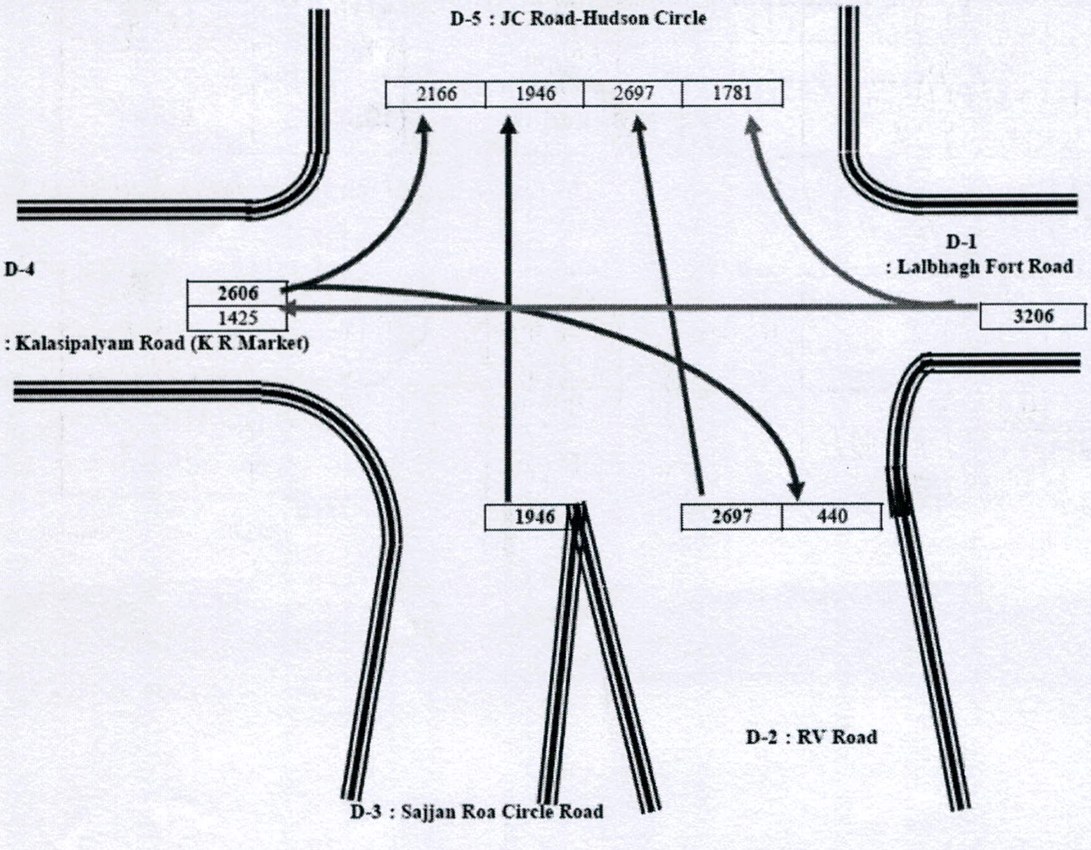

D-5 : JC Road-Hudson Circle
2166
1946
2697
1781
D-1
: Lalbhagh Fort Road
3206
D-4
2606
1425
: Kalasipalyam Road (K R Market)
1946
2697
440
D-2 : RV Road
D-3 : Sajjan Roa Circle Road

Figure 2-4: Evening Peak Hour Traffic Flow at Minerva Junction

2.2.2 JC Road with Armugum Mudaliar Road-Siddaiah Road Junction

JC Road with Armugum Mudaliar Road-Siddaiah Road Junction is a Four leg junction and presently has restricted directional movements at the junction. As per the present traffic flow, following are the directions allowed for traffic movement.

- Minerva Junction to Hudson Circle (JC Road)
- Minerva Junction to Siddaiah Road (Urvashi Theatre)
- Armugam Mudaliar Road to Hudson Circle (JC Road)
- Armugam Mudaliar Road to Siddaiah Road (Urvashi Theatre)

Based on these traffic flow at the junction, the data collected for the three days has been averaged and summary of the data analysis are presented below for the junction.

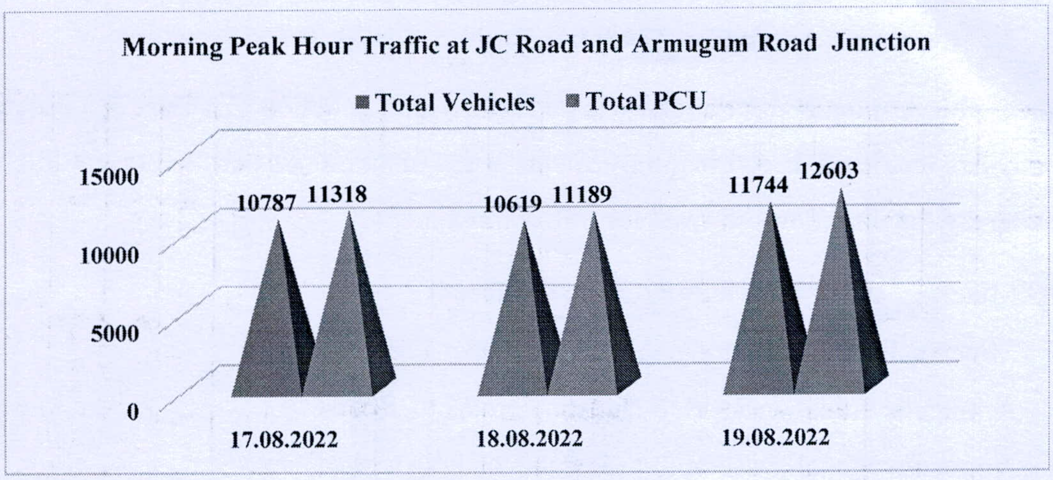
Summary of three days Morning Peak Hour and Evening Peak Hours are presented below.

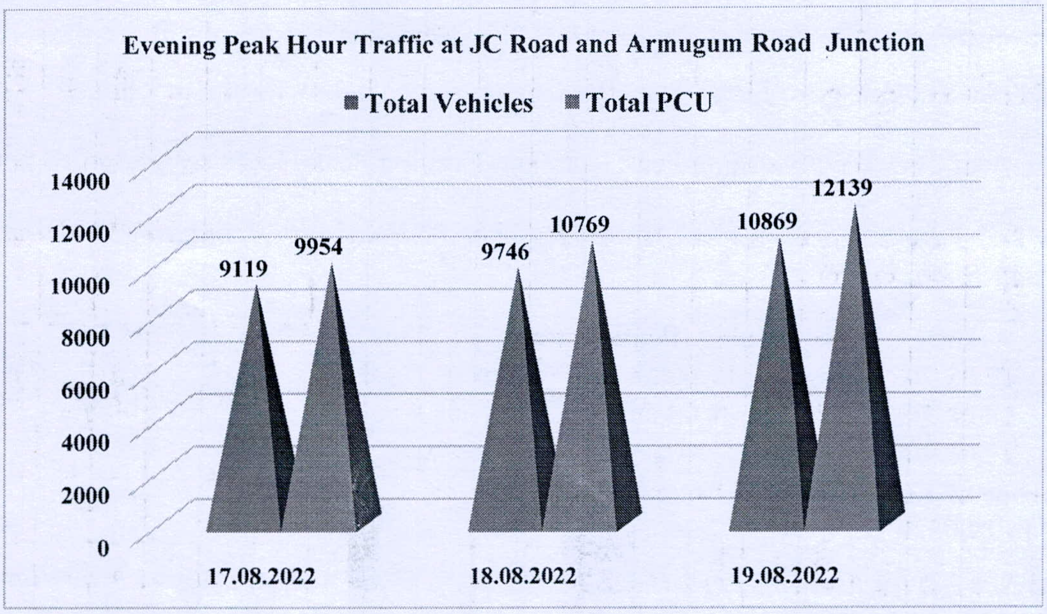
Table 2-7: 3 Days Morning Peak Hour Traffic at JC Road with Armugum Mudaliar Road-Siddaiah Road Junction

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	11.00am to 12.00pm	10787	11318
18.08.2022	11.00am to 12.00pm	10619	11189
19.08.2022	11.00am to 12.00pm	11744	12603
Average of 17.08.2022 to 19.08.2022	**11.00am to 12.00pm**	**11050**	**11704**

Table 2-8: 3 Days Evening Peak Hour Traffic at JC Road with Armugum Mudaliar Road-Siddaiah Road Junction

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	04.00pm to 05.00pm	9119	9954
18.08.2022	04.00pm to 05.00pm	9746	10769
19.08.2022	04.00pm to 05.00pm	10869	12139
Average of 17.08.2022 to 19.08.2022	**04.00pm to 05.00pm**	**9911**	**10954**





Detailed Peak hour traffic details including, directional flow, vehicle types, composition, percentage of directional flow are presented in both tables and graphical representation for ready reference below for both morning peak and evening peak hours.

Table 2-9: Summary of Morning Peak Hour Traffic at JC Road with Armugum Mudaliar Road-Siddaiah Road Junction

Vehicles		D-1 to D-3	D-1 to D-4	Total Traffic from D-1	D-2 to D-3	D-2 to D-4	Total Traffic from D-2	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	2 Wheelers	4607	1065	**5672**	213	619	**832**	**6504**	**58.86%**
	Auto Rickshaw	1102	386	**1488**	94	265	**359**	**1847**	**16.71%**
	Car/Jeep/Van	1362	569	**1930**	42	207	**249**	**2179**	**19.72%**
	Min-Bus	11	17	**27**	0	3	**3**	**30**	**0.27%**
	Std. Bus	96	111	**207**	0	0	**0**	**207**	**1.87%**
	LCV	62	69	**131**	30	67	**97**	**227**	**2.06%**
	2 Axle Trucks	18	7	**25**	4	9	**13**	**38**	**0.34%**
	3 Axle Trucks	11	0	**11**	0	0	**0**	**11**	**0.10%**
	MAVs	0	1	**1**	0	0	**0**	**1**	**0.01%**
	Tractor With Trailer	1	0	**1**	0	0	**0**	**1**	**0.01%**
	Tractor Without Trailer	0	0	**0**	0	0	**0**	**0**	**0.00%**
SLOW MOVING VEHICLES	Cycle	1	0	**1**	1	2	**3**	**4**	**0.04%**
	Bullock Cart	0	0	**0**	0	0	**0**	**0**	**0.00%**
	Horse Drawn Vehicle	0	0	**0**	0	0	**0**	**0**	**0.00%**
	Hand Drawn Vehicle	0	0	**0**	0	0	**0**	**0**	**0.00%**
Total Vehicles		**7271**	**2224**	**9494**	**384**	**1172**	**1556**	**11050**	**100.00%**
Total PCU		**7422**	**2522**	**9944**	**440**	**1320**	**1760**	**11704**	**0**
Directional Distribution		**65.8%**	**20.1%**	**85.9%**	**3.5%**	**10.6%**	**14.1%**	**100.0%**	**0.0%**

Table 2-10: Summary of Evening Peak Hour Traffic at JC Road with Armugum Mudaliar Road-Siddaiah Road Junction

Vehicles		D-1 to D-3	D-1 to D-4	Total Traffic from D-1	D-2 to D-3	D-2 to D-4	Total Traffic from D-2	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	2 Wheelers	3288	1134	**4422**	266	536	**802**	**5224**	52.71%
	Auto Rickshaw	938	621	**1560**	118	247	**365**	**1925**	19.42%
	Car/Jeep/Van	1380	582	**1962**	74	180	**254**	**2216**	22.36%
	Min-Bus	8	10	**18**	0	2	**2**	**20**	0.20%
	Std. Bus	125	102	**227**	0	0	**0**	**227**	2.29%
	LCV	107	62	**169**	33	67	**100**	**269**	2.72%
	2 Axle Trucks	7	9	**16**	3	3	**6**	**22**	0.22%
	3 Axle Trucks	3	0	**3**	0	0	**0**	**3**	0.03%
	MAVs	0	0	**0**	0	0	**0**	**0**	0.00%
	Tractor With Trailer	0	1	**1**	0	0	**0**	**1**	0.01%
	Tractor Without Trailer	0	0	**0**	0	0	**0**	**0**	0.00%
SLOW MOVING VEHICLES	Cycle	1	0	**1**	2	1	**3**	**4**	0.04%
	Bullock Cart	0	0	**0**	0	0	**0**	**0**	0.00%
	Horse Drawn Vehicle	0	0	**0**	0	0	**0**	**0**	0.00%
	Hand Drawn Vehicle	0	0	**0**	0	0	**0**	**0**	0.00%
Total Vehicles		**5857**	**2522**	**8379**	**496**	**1037**	**1533**	**9911**	**100.00%**
Total PCU		**6186**	**3024**	**9210**	**564**	**1180**	**1744**	**10954**	**0**
Directional Distribution		**59.1%**	**25.4%**	**84.5%**	**5.0%**	**10.5%**	**15.5%**	**100.0%**	**0.0%**

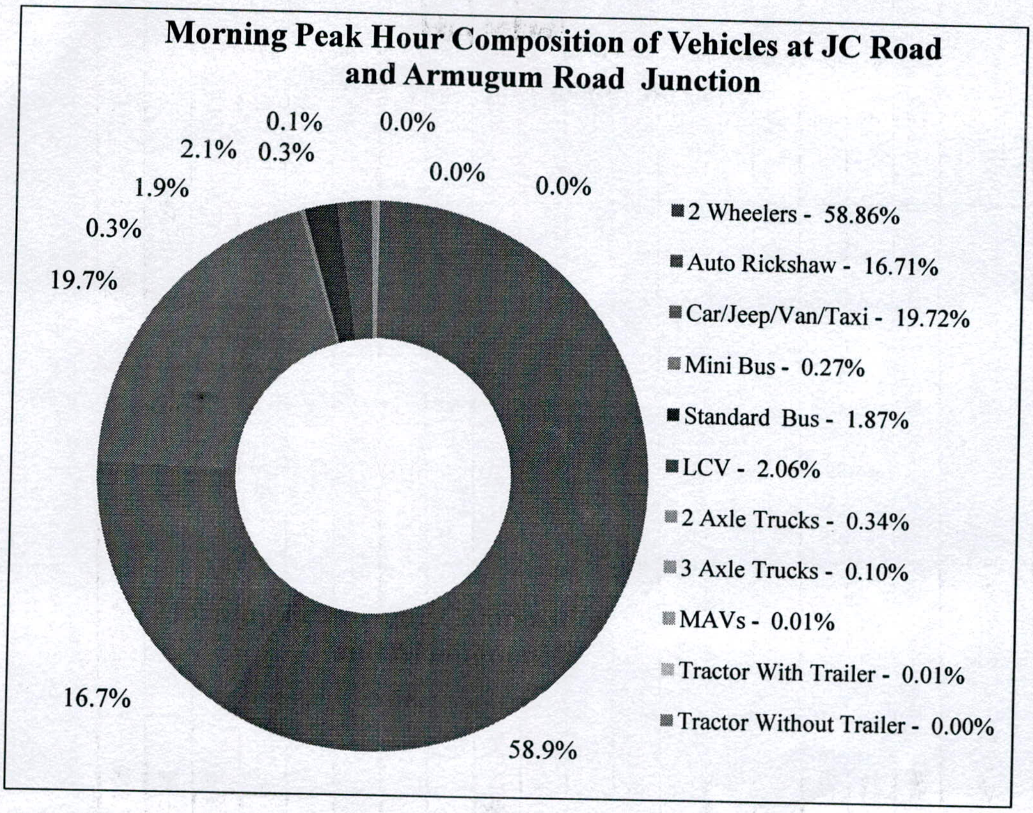


Figure 2-5: Morning Peak Hour Composition at JC Road with Armugum Mudaliar Road-Siddaiah Road Junction

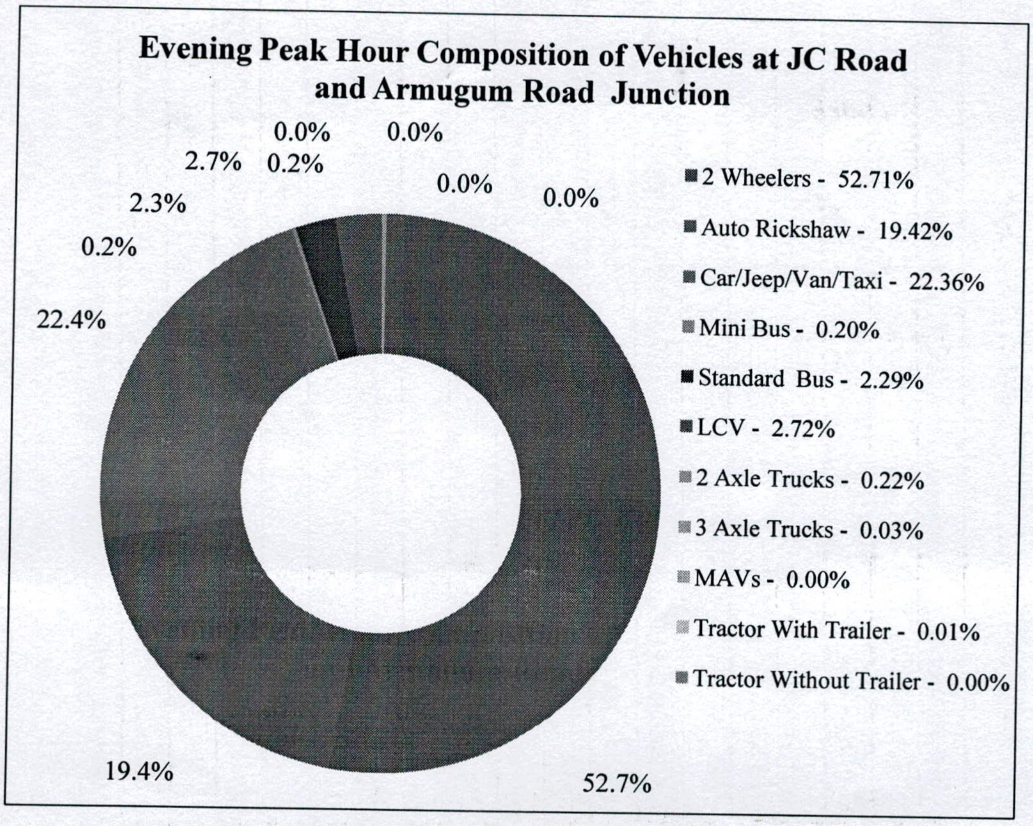


Figure 2-6: Evening Peak Hour Composition at JC Road with Armugum Mudaliar Road-Siddaiah Road Junction

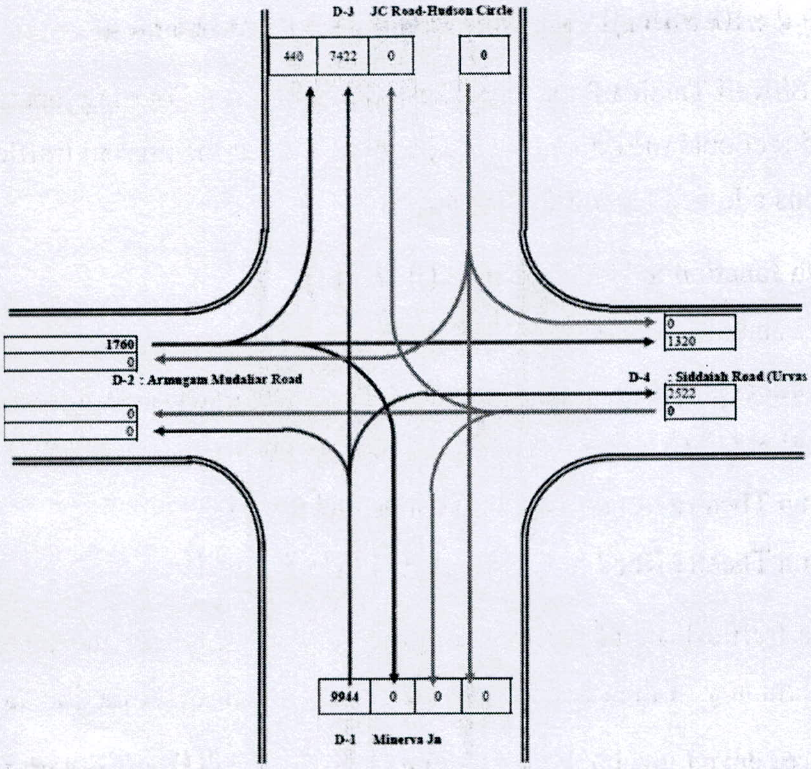

D-3 JC Road-Hudson Circle
440
7422
0
0
1760
0
D-2 : Armugam Mudaliar Road
0
0
0
1320
D-4 : Siddaiah Road (Urvas
2522
0
9944
0
0
0
D-1 Minerva Jn

Figure 2-7: Morning Peak Hour Traffic Flow at JC Road with Armugum Mudaliar Road-Siddaiah Road Junction

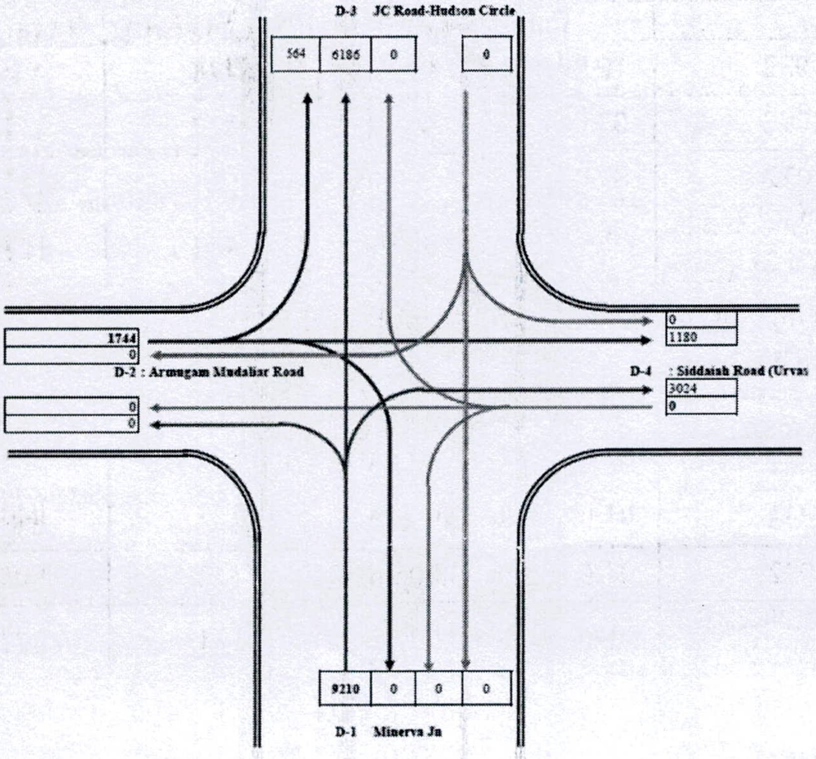

D-3 JC Road-Hudson Circle
564
6186
0
0
1744
0
D-2 : Armugam Mudaliar Road
0
0
0
1180
D-4 : Siddaiah Road (Urvas
3024
0
9210
0
0
0
D-1 Minerva Jn

Figure 2-8: Evening Peak Hour Traffic Flow at JC Road with Armugum Mudaliar Road-Siddaiah Road Junction

2.2.3 JC Road with Shivaji Talkies-Poornima Theatre Junction

JC Road with Shivaji Talkies-Poornima Theatre Junction is a Four leg junction and presently has restricted directional movements at the junction. As per the present traffic flow, following are the directions allowed for traffic movement.

- Minerva Junction to Hudson Circle (JC Road)
- Minerva Junction to Poornima Theatre Road
- K R Market (1st Cross Road) to Hudson Circle (JC Road)
- K R Market (1st Cross Road) to Poornima Theatre Road
- Poornima Theatre Road to Hudson Circle (JC Road)
- Poornima Theatre Road to K R Market (1st Cross Road)

Based on these traffic flow at the junction, the data collected for the three days has been averaged and summary of the data analysis are presented below for the junction.

Summary of three days Morning Peak Hour and Evening Peak Hours are presented below.

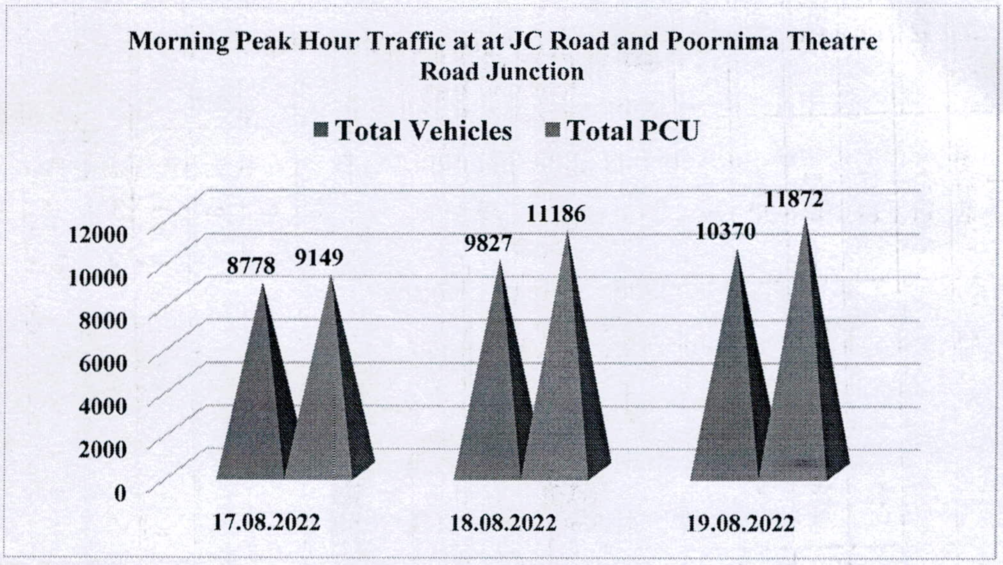
Table 2-11: 3 Days Morning Peak Hour Traffic at JC Road with Shivaji Talkies-Poornima Theatre Junction

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	10.00am to 11.00am	8778	9149
18.08.2022	09.00am to 10.00am	9827	11186
19.08.2022	09.00am to 10.00am	10370	11872
Average of 17.08.2022 to 19.08.2022	**09.00am to 10.00am**	**9608**	**10700**

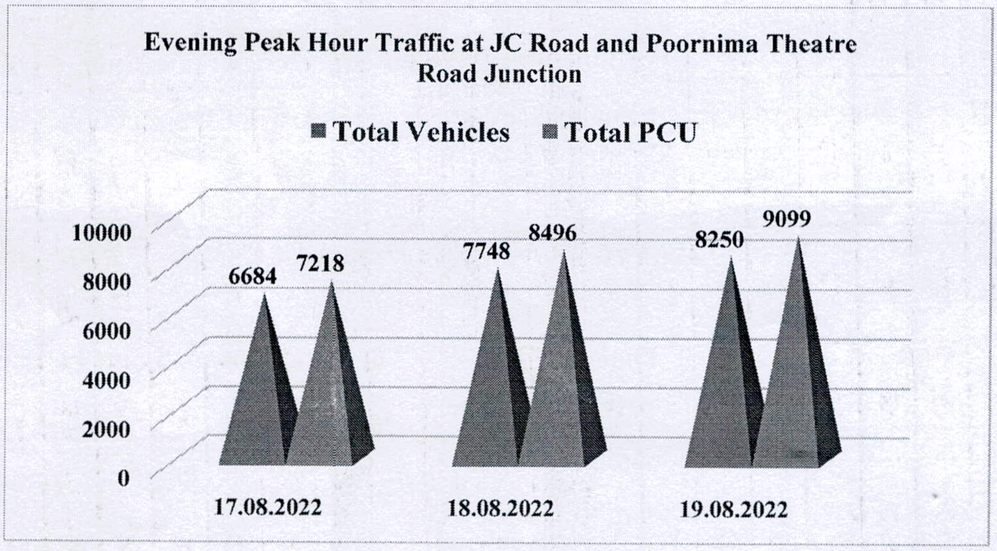
Table 2-12: 3 Days Evening Peak Hour Traffic at JC Road with Shivaji Talkies-Poornima Theatre Junction

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	04.00pm to 05.00pm	6684	7218
18.08.2022	04.00pm to 05.00pm	7748	8496
19.08.2022	04.00pm to 05.00pm	8250	9099
Average of 17.08.2022 to 19.08.2022	**04.00pm to 05.00pm**	**7561**	**8271**

Morning Peak Hour Traffic at at JC Road and Poornima Theatre Road Junction



Evening Peak Hour Traffic at JC Road and Poornima Theatre Road Junction



Detailed Peak hour traffic details including, directional flow, vehicle types, composition, percentage of directional flow are presented in both tables and graphical representation for ready reference below for both morning peak and evening peak hours.

Table 2-13: Summary of Morning Peak Hour Traffic at JC Road with Shivaji Talkies-Poornima Theatre Junction

Vehicles		D-1 to D-3	D-1 to D-4	Total Traffic from D-1	D-2 to D-3	D-2 to D-4	Total Traffic from D-2	D-4 to D-2	D-4 to D-3	Total Traffic from D-4	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	2 Wheelers	2935	1599	4534	125	175	300	162	371	533	5367	55.86%
	Auto Rickshaw	648	909	1557	8	72	80	138	270	408	2045	21.28%
	Car/Jeep/Van	1230	238	1468	5	18	23	70	161	231	1722	17.92%
	Min-Bus	18	5	23	0	0	0	0	6	6	29	0.31%
	Std. Bus	184	0	184	0	0	0	0	13	13	197	2.05%
	LCV	93	16	109	6	7	14	19	36	55	177	1.84%
	2 Axle Trucks	18	2	20	0	0	0	14	15	29	49	0.51%
	3 Axle Trucks	3	0	3	1	0	1	0	0	0	4	0.04%
	MAVs	2	0	2	0	0	0	0	0	0	2	0.02%
	Tractor With Trailer	0	0	0	0	0	0	0	1	1	1	0.01%
	Tractor Without Trailer	0	0	0	0	0	0	0	0	0	0	0.00%
SLOW MOVING VEHICLES	Cycle	7	4	11	0	0	0	0	5	5	16	0.16%
	Bullock Cart	0	0	0	0	0	0	0	0	0	0	0.00%
	Horse Drawn Vehicle	0	0	0	0	0	0	0	0	0	0	0.00%
	Hand Drawn Vehicle	0	0	0	0	0	0	0	0	0	0	0.00%
Total Vehicles		5138	2773	7910	145	273	418	402	878	1280	9608	100.00%
Total PCU		5349	3291	8640	127	304	431	524	1104	1629	10700	
Directional Distribution		53.5%	28.9%	82.3%	1.5%	2.8%	4.3%	4.2%	9.1%	13.3%	100.0%	

Table 2-14: Summary of Evening Peak Hour Traffic at JC Road with Shivaji Talkies-Poornima Theatre Junction

Vehicles		D-1 to D-3	D-1 to D-4	Total Traffic from D-1	D-2 to D-3	D-2 to D-4	Total Traffic from D-2	D-4 to D-2	D-4 to D-3	Total Traffic from D-4	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	2 Wheelers	2082	765	2847	87	147	234	262	558	820	3901	51.59%
	Auto Rickshaw	597	327	924	27	100	127	65	276	342	1392	18.42%
	Car/Jeep/Van	1158	253	1411	5	7	12	130	310	441	1863	24.65%
	Min-Bus	28	5	33	0	0	0	0	4	4	38	0.50%
	Std. Bus	135	0	135	0	0	0	0	10	10	145	1.92%
	LCV	46	58	104	11	7	18	31	33	64	185	2.45%
	2 Axle Trucks	6	0	6	0	0	0	12	3	14	21	0.27%
	3 Axle Trucks	3	0	3	0	0	0	0	0	0	3	0.04%
	MAVs	0	0	0	0	0	0	0	0	0	0	0.00%
	Tractor With Trailer	0	0	0	0	0	0	0	1	1	1	0.01%
	Tractor Without Trailer	0	0	0	0	0	0	0	0	0	0	0.00%
SLOW MOVING VEHICLES	Cycle	4	5	9	2	0	2	0	0	0	11	0.15%
	Bullock Cart	0	0	0	0	0	0	0	0	0	0	0.00%
	Horse Drawn Vehicle	0	0	0	0	0	0	0	0	0	0	0.00%
	Hand Drawn Vehicle	0	0	0	0	0	0	0	0	0	0	0.00%
Total Vehicles		4060	1412	5472	132	261	393	501	1195	1696	7561	100.00%
Total PCU		4344	1570	5913	140	327	467	527	1364	1891	8271	
Directional Distribution		53.7%	18.7%	72.4%	1.7%	3.4%	5.2%	6.6%	15.8%	22.4%	100.0%	

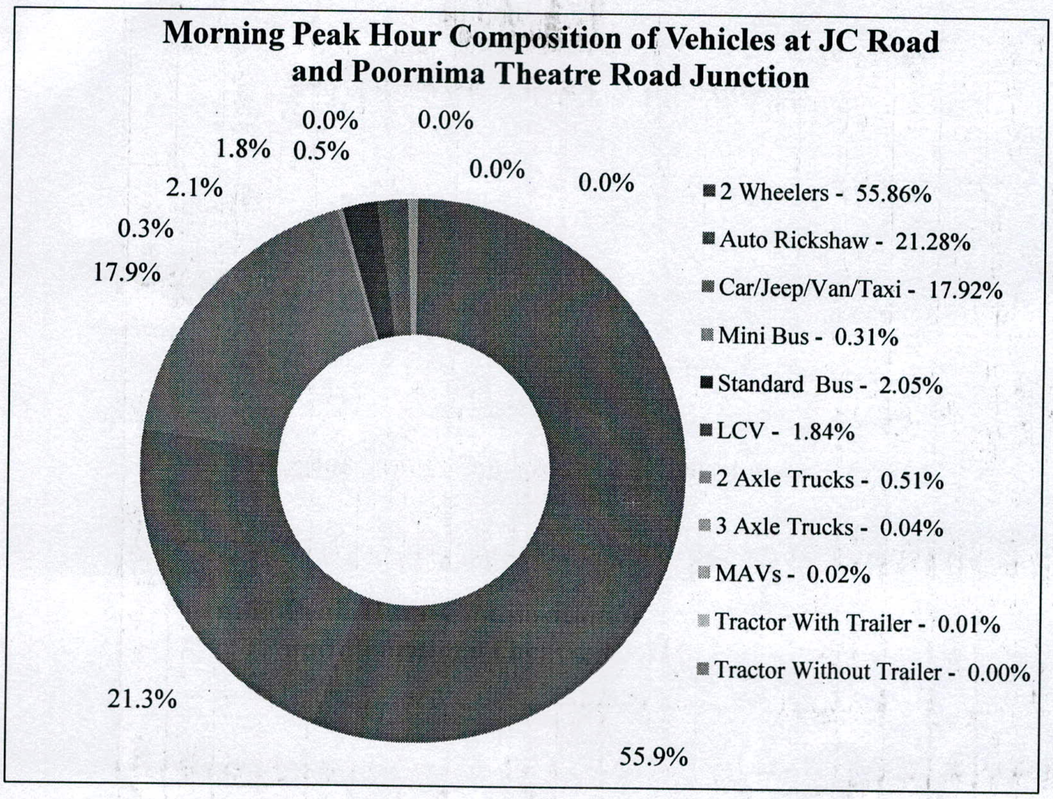


Figure 2-9: Morning Peak Hour Composition at JC Road with Shivaji Talkies-Poornima Theatre Junction

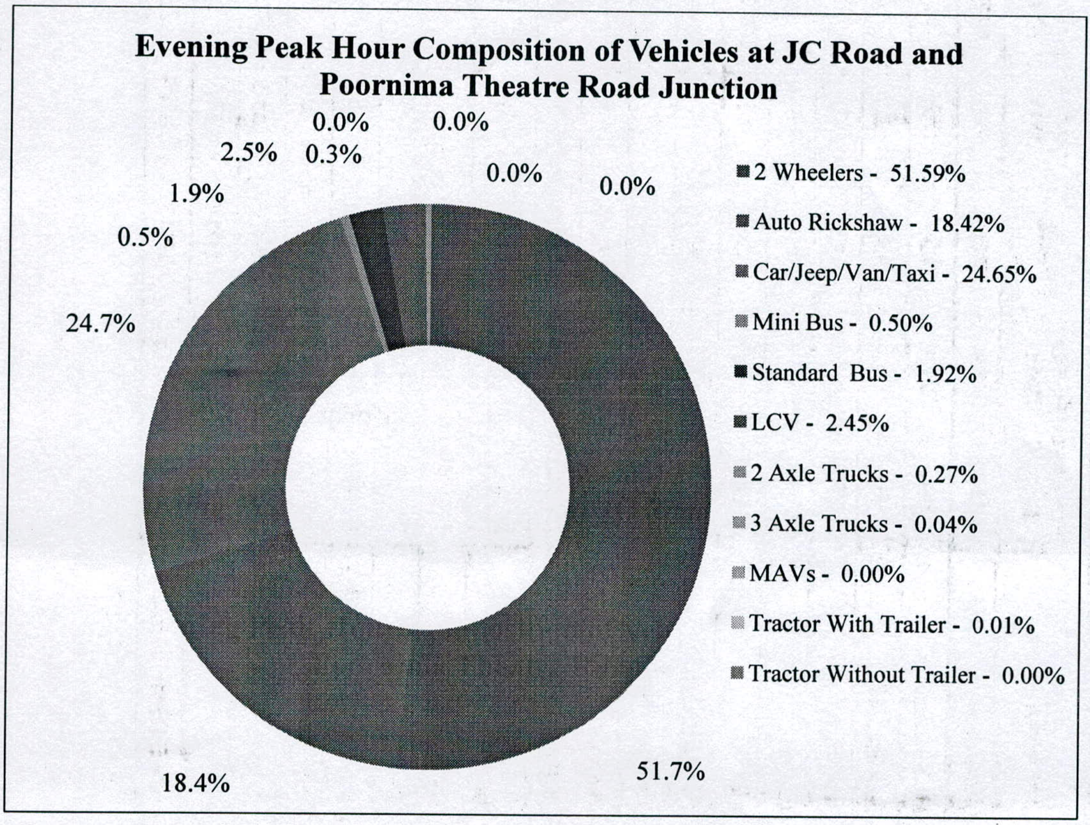


Figure 2-10: Evening Peak Hour Composition at JC Road with Shivaji Talkies-Poornima Theatre Junction

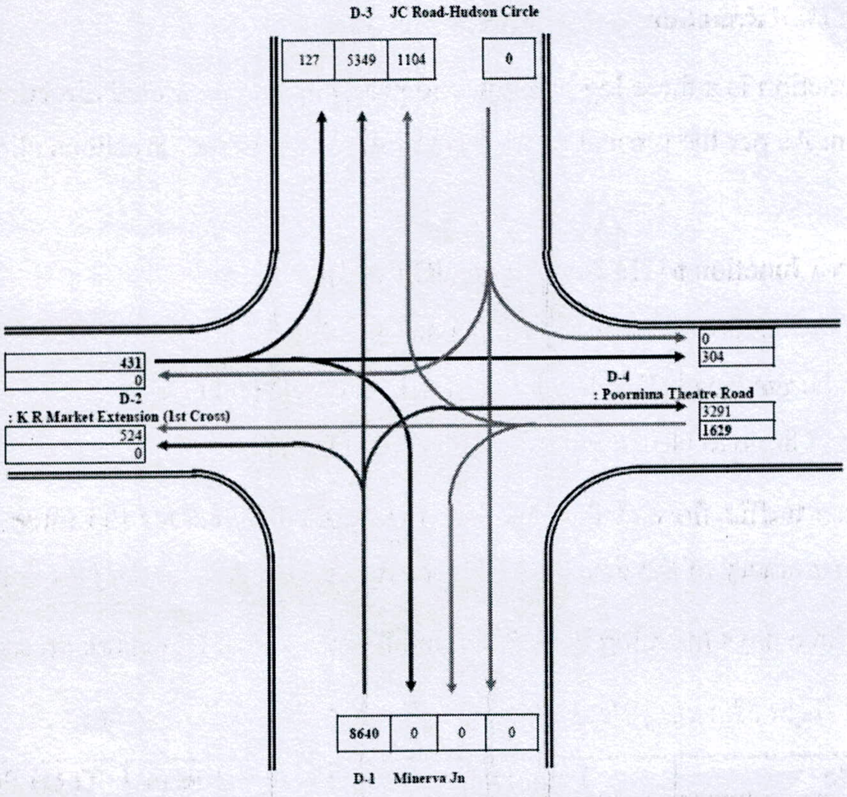


Figure 2-11: Morning Peak Hour Traffic Flow at JC Road with Shivaji Talkies-Poornima Theatre Junction

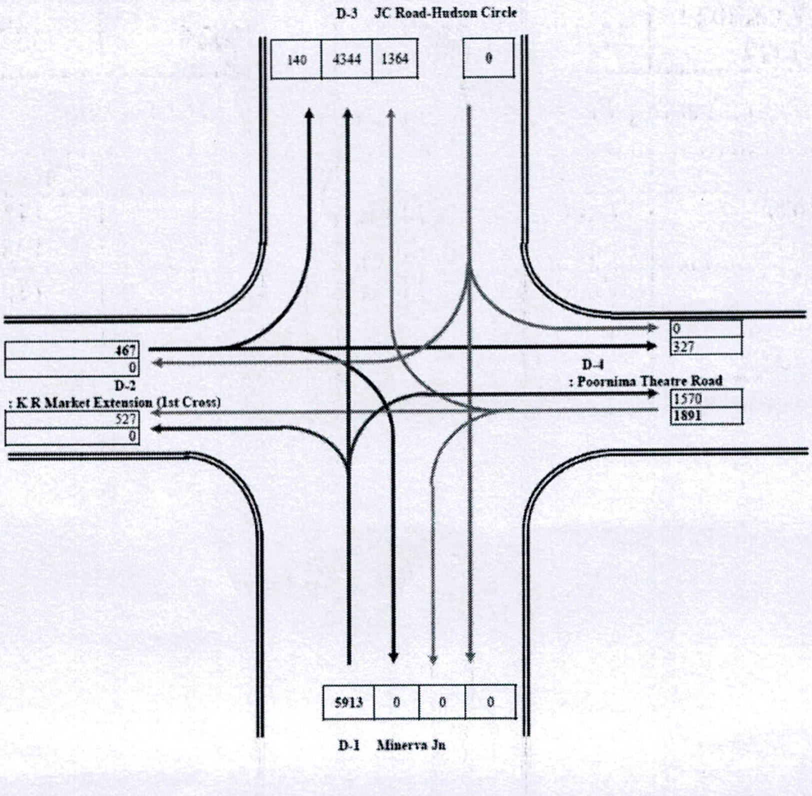


Figure 2-12: Evening Peak Hour Traffic Flow at JC Road with Shivaji Talkies-Poornima Theatre Junction

2.2.4 Town Hall Junction

Town Hall Junction is a three leg junction and presently has restricted directional movements at the junction. As per the present traffic flow, following are the directions allowed for traffic movement.

- Minerva Junction to Hudson Circle (JC Road)
- Minerva Junction to Nrupathunga Road (K R Market)
- Nrupathunga Road (K R Market) to Hudson Circle (JC Road)
- Hudson Circle to Nrupathunga Road (K R Market)

Based on these traffic flow at the junction, the data collected for the three days has been averaged and summary of the data analysis are presented below for the junction.

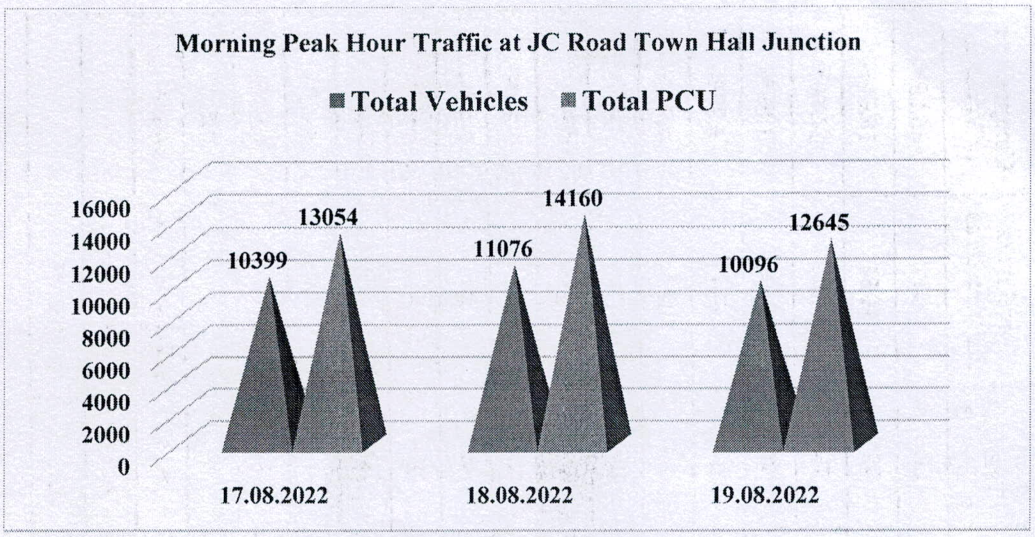
Summary of three days Morning Peak Hour and Evening Peak Hours are presented below.

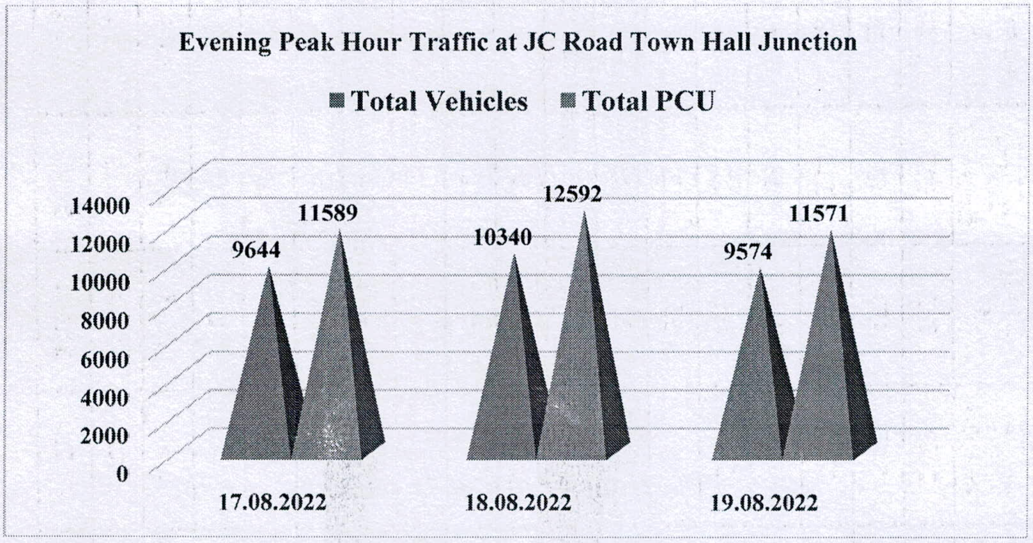
Table 2-15: 3 Days Morning Peak Hour Traffic at Town Hall Junction

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	11.00am to 12.00pm	10399	13054
18.08.2022	11.00am to 12.00pm	11076	14160
19.08.2022	11.00am to 12.00pm	10096	12645
Average of 17.08.2022 to 19.08.2022	**11.00am to 12.00pm**	**10524**	**13286**

Table 2-16: 3 Days Evening Peak Hour Traffic at Town Hall Junction

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	05.00pm to 06.00pm	9644	11589
18.08.2022	05.00pm to 06.00pm	10340	12592
19.08.2022	06.00pm to 07.00pm	9574	11571
Average of 17.08.2022 to 19.08.2022	**05.00pm to 06.00pm**	**9758**	**11800**





Detailed Peak hour traffic details including, directional flow, vehicle types, composition, percentage of directional flow are presented in both tables and graphical representation for ready reference below for both morning peak and evening peak hours.

Table 2-17: Summary of Morning Peak Hour Traffic at Town Hall Junction

Vehicles		D-1 to D-2	D-1 to D-3	Total Traffic from D-1	D-2 to D-3	Total Traffic from D-2	D-3 to D-2	Total Traffic from D-3	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	**2 Wheelers**	874	1263	**2138**	993	**993**	1787	**1787**	**4917**	**46.73%**
	Auto Rickshaw	410	387	**797**	459	**459**	708	**708**	**1964**	**18.66%**
	Car/Jeep/Van	469	815	**1284**	534	**534**	788	**788**	**2606**	**24.76%**
	Min-Bus	15	15	**30**	59	**59**	25	**25**	**114**	**1.09%**
	Std. Bus	211	113	**324**	196	**196**	150	**150**	**671**	**6.37%**
	LCV	65	16	**81**	33	**33**	53	**53**	**167**	**1.58%**
	2 Axle Trucks	16	13	**29**	32	**32**	23	**23**	**84**	**0.80%**
	3 Axle Trucks	1	0	**1**	0	**0**	0	**0**	**1**	**0.01%**
	MAVs	0	0	**0**	0	**0**	0	**0**	**0**	**0.00%**
	Tractor With Trailer	0	0	**0**	0	**0**	0	**0**	**0**	**0.00%**
	Tractor Without Trailer	0	0	**0**	0	**0**	0	**0**	**0**	**0.00%**
SLOW MOVING VEHICLES	**Cycle**	0	0	**0**	0	**0**	0	**0**	**0**	**0.00%**
	Bullock Cart	0	0	**0**	0	**0**	0	**0**	**0**	**0.00%**
	Horse Drawn Vehicle	0	0	**0**	0	**0**	0	**0**	**0**	**0.00%**
	Hand Drawn Vehicle	0	0	**0**	0	**0**	0	**0**	**0**	**0.00%**
Total Vehicles		**2061**	**2623**	**4684**	**2305**	**2305**	**3535**	**3535**	**10524**	**100.00%**
Total PCU		**2877**	**3028**	**5905**	**3120**	**3120**	**4260**	**4260**	**13286**	
Directional Distribution		**19.6%**	**24.9%**	**44.5%**	**21.9%**	**21.9%**	**33.6%**	**33.6%**	**100.0%**	

Table 2-18: Summary of Evening Peak Hour Traffic at Town Hall Junction

Vehicles		D-1 to D-2	D-1 to D-3	Total Traffic from D-1	D-2 to D-3	Total Traffic from D-2	D-3 to D-2	Total Traffic from D-3	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	2 Wheelers	630	1042	1672	540	540	2430	2430	4642	47.58%
	Auto Rickshaw	311	420	730	291	291	628	628	1650	16.91%
	Car/Jeep/Van	364	687	1051	306	306	1143	1143	2500	25.62%
	Min-Bus	15	14	29	18	18	32	32	79	0.81%
	Std. Bus	112	78	189	117	117	170	170	476	4.88%
	LCV	91	65	156	59	59	107	107	321	3.29%
	2 Axle Trucks	12	14	26	20	20	39	39	86	0.88%
	3 Axle Trucks	0	0	0	0	0	0	0	0	0.00%
	MAVs	0	0	0	0	0	0	0	0	0.00%
	Tractor With Trailer	0	2	2	0	0	0	0	2	0.02%
	Tractor Without Trailer	0	0	0	0	0	0	0	0	0.00%
SLOW MOVING VEHICLES	Cycle	0	2	2	0	0	0	0	2	0.02%
	Bullock Cart	0	0	0	0	0	0	0	0	0.00%
	Horse Drawn Vehicle	0	0	0	0	0	0	0	0	0.00%
	Hand Drawn Vehicle	0	0	0	0	0	0	0	0	0.00%
Total Vehicles		1534	2323	3858	1350	1350	4550	4550	9758	100.00%
Total PCU		2046	2745	4792	1877	1877	5131	5131	11800	
Directional Distribution		15.7%	23.8%	39.5%	13.8%	13.8%	46.6%	46.6%	100.0%	

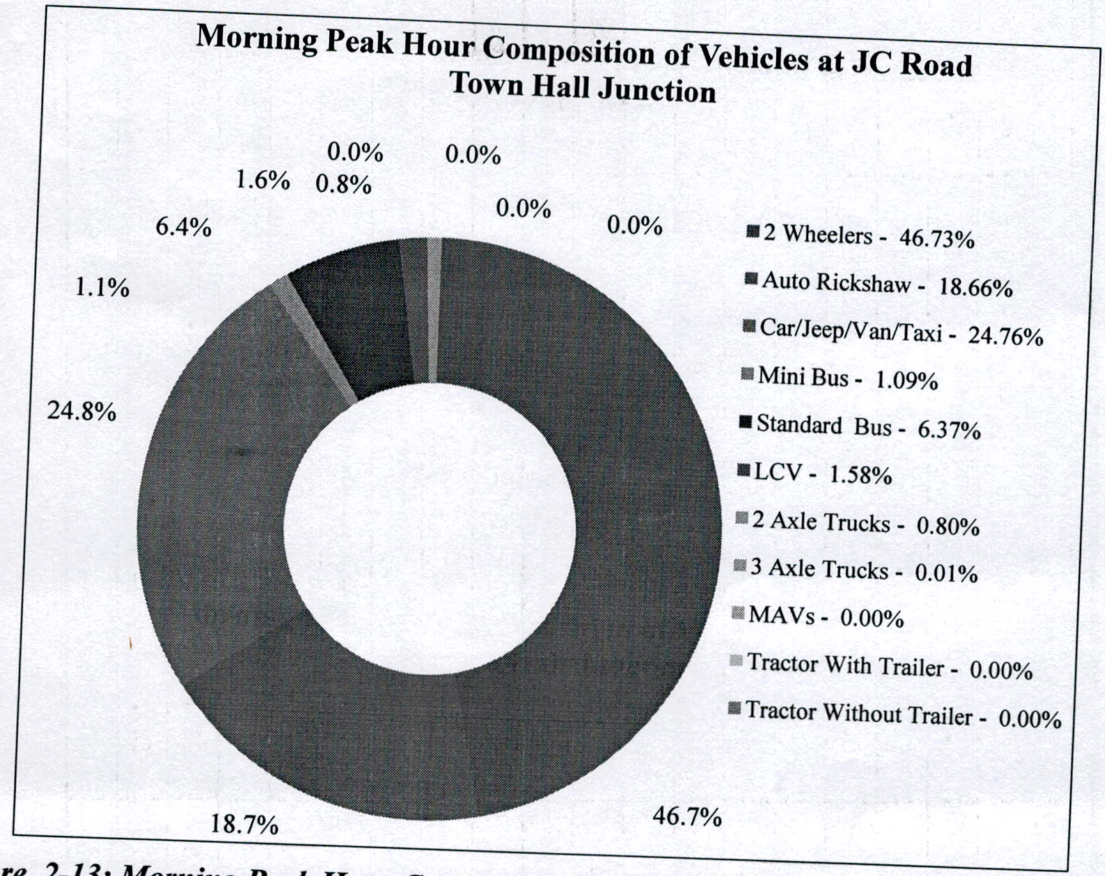


Figure 2-13: Morning Peak Hour Composition at Town Hall Junction

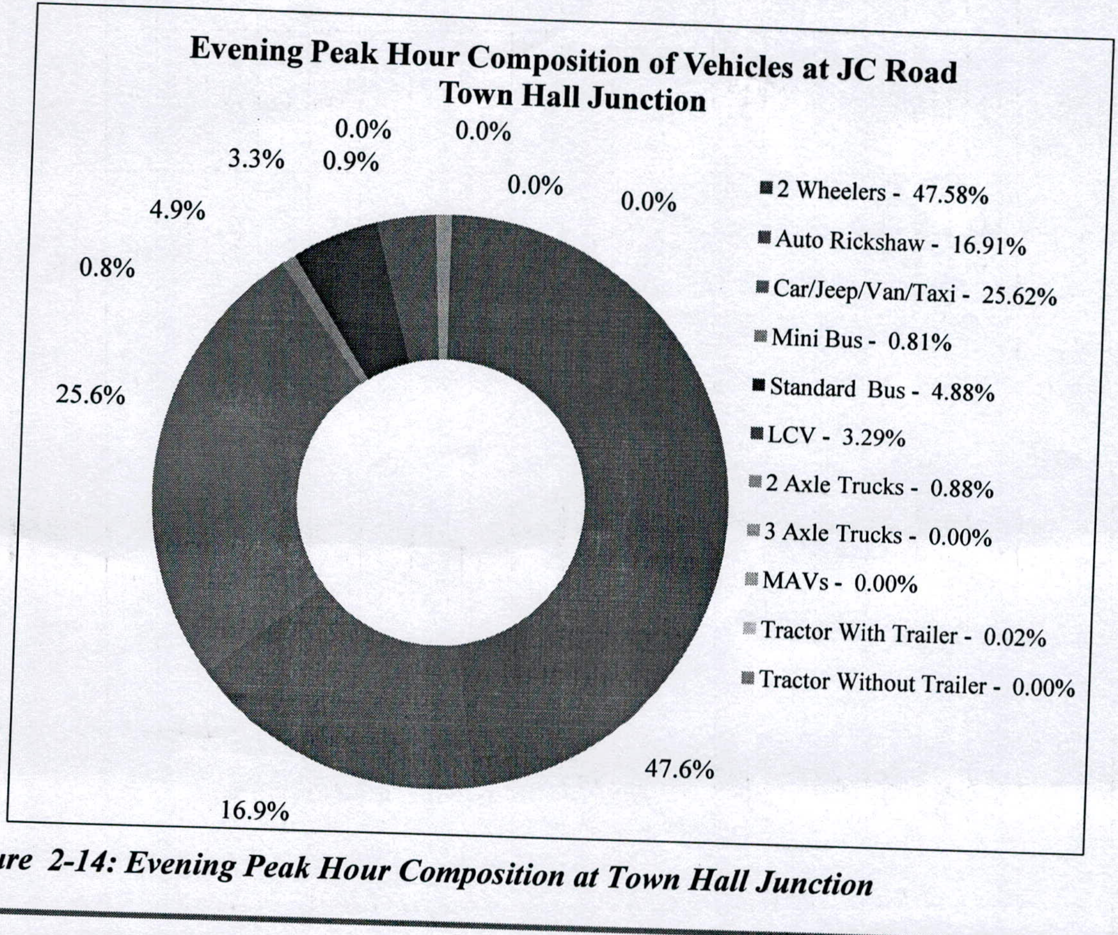


Figure 2-14: Evening Peak Hour Composition at Town Hall Junction

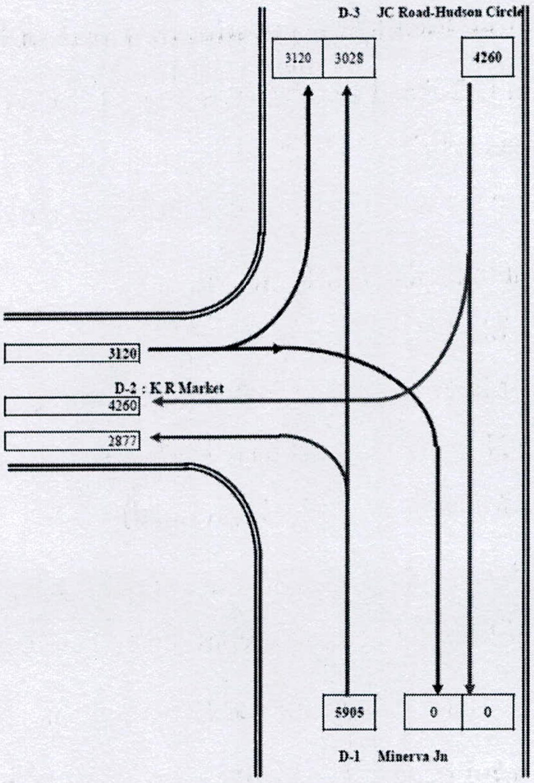


Figure 2-15: Morning Peak Hour Traffic Flow at Town Hall Junction

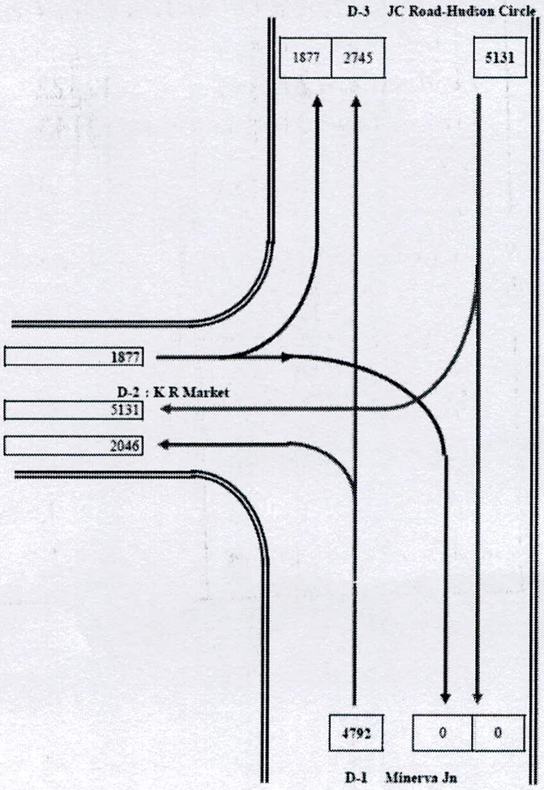


Figure 2-16: Evening Peak Hour Traffic Flow at Town Hall Junction

2.2.5 Badami House Junction (JC Road with SP Road and Mission Road)

Badami House Junction (JC Road with SP Road and Mission Road) Junction is a Four leg junction and presently has restricted directional movements at the junction. As per the present traffic flow, following are the directions allowed for traffic movement.

- Minerva Junction to Hudson Circle (JC Road)
- SP Road to (K R Market) to Hudson Circle (JC Road)
- SP Road to (K R Market) to Mission Road (Lalbagh Road)
- Hudson Circle to Nrupathunga Road (K R Market)
- Hudson Circle to Mission Road (Lalbagh Road)

Based on these traffic flow at the junction, the data collected for the three days has been averaged and summary of the data analysis are presented below for the junction.

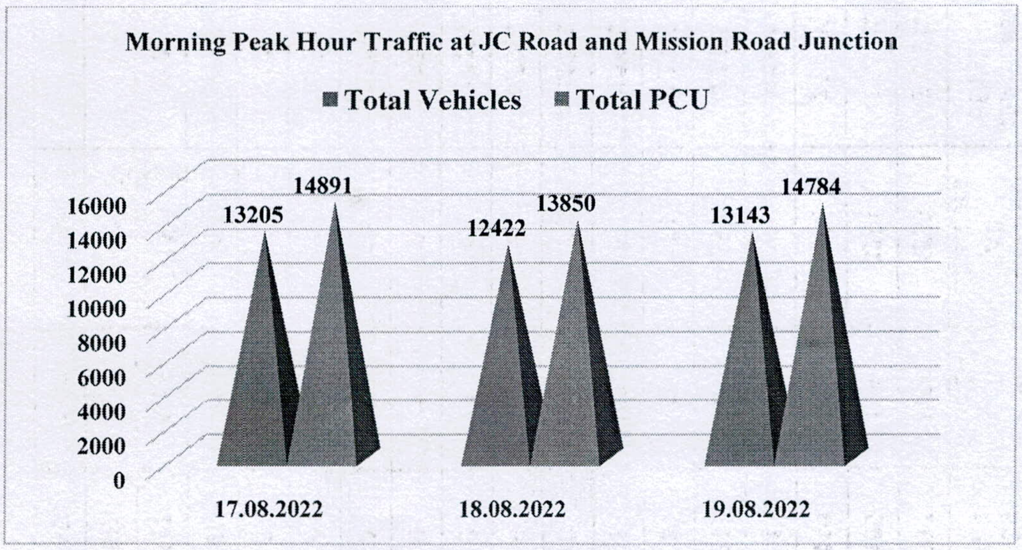
Summary of three days Morning Peak Hour and Evening Peak Hours are presented below.

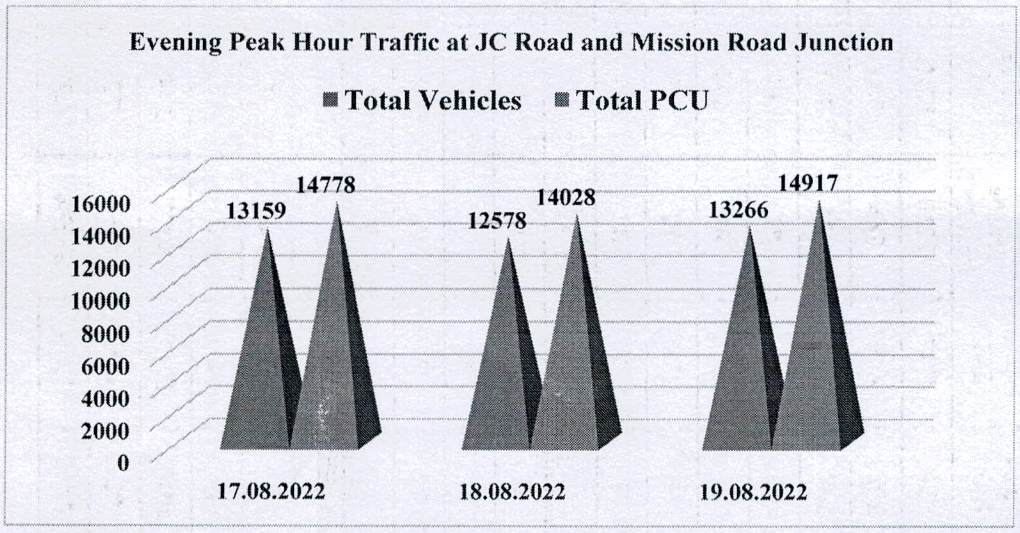
Table 2-19: 3 Days Morning Peak Hour Traffic at Badami House Junction (JC Road with SP Road and Mission Road)

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	11.00am to 12.00pm	13205	14891
18.08.2022	11.00am to 12.00pm	12422	13850
19.08.2022	11.00am to 12.00pm	13143	14784
Average of 17.08.2022 to 19.08.2022	**11.00am to 12.00pm**	**12923**	**14508**

Table 2-20: 3 Days Evening Peak Hour Traffic at Badami House Junction (JC Road with SP Road and Mission Road)

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	05.00pm to 06.00pm	13159	14778
18.08.2022	05.00pm to 06.00pm	12578	14028
19.08.2022	05.00pm to 06.00pm	13266	14917
Average of 17.08.2022 to 19.08.2022	**05.00pm to 06.00pm**	**13001**	**14574**





Detailed Peak hour traffic details including, directional flow, vehicle types, composition, percentage of directional flow are presented in both tables and graphical representation for ready reference below for both morning peak and evening peak hours.

Table 2-21: Summary of Morning Peak Hour Traffic at Badami House Junction (JC Road with SP Road and Mission Road)

Vehicles		D-1 to D-3	Total Traffic from D-1	D-2 to D-3	D-2 to D-4	Total Traffic from D-2	D-3 to D-1	D-3 to D-4	Total Traffic from D-3	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	**2 Wheelers**	2345	**2345**	931	1279	**2210**	1741	237	**1978**	**6533**	**50.55%**
	Auto Rickshaw	693	**693**	297	489	**786**	700	105	**805**	**2284**	**17.67%**
	Car/Jeep/Van	1348	**1348**	540	336	**876**	780	150	**930**	**3154**	**24.41%**
	Min-Bus	57	**57**	13	13	**27**	14	1	**15**	**99**	**0.76%**
	Std. Bus	276	**276**	5	56	**61**	134	115	**249**	**586**	**4.54%**
	LCV	28	**28**	20	52	**72**	46	8	**53**	**154**	**1.19%**
	2 Axle Trucks	36	**36**	18	15	**33**	28	1	**29**	**98**	**0.76%**
	3 Axle Trucks	0	**0**	0	2	**2**	2	0	**2**	**4**	**0.03%**
	MAVs	0	**0**	0	0	**0**	0	0	**0**	**0**	**0.00%**
	Tractor With Trailer	0	**0**	0	1	**1**	1	0	**1**	**2**	**0.02%**
	Tractor Without Trailer	0	**0**	0	0	**0**	0	0	**0**	**0**	**0.00%**
SLOW MOVING VEHICLES	**Cycle**	2	**2**	1	4	**5**	3	0	**3**	**10**	**0.07%**
	Bullock Cart	0	**0**	0	0	**0**	0	0	**0**	**0**	**0.00%**
	Horse Drawn Vehicle	0	**0**	0	0	**0**	0	0	**0**	**0**	**0.00%**
	Hand Drawn Vehicle	0	**0**	0	0	**0**	0	0	**0**	**0**	**0.00%**
Total Vehicles		**4785**	**4785**	**1824**	**2247**	**4072**	**3449**	**617**	**4066**	**12923**	**100.00%**
Total PCU		**5299**	**5299**	**1929**	**2535**	**4464**	**3939**	**807**	**4746**	**14508**	
Directional Distribution		**37.0%**	**37.0%**	**14.1%**	**17.4%**	**31.5%**	**26.7%**	**4.8%**	**31.5%**	**100.0%**	

Table 2-22: Summary of Evening Peak Hour Traffic at Badami House Junction (JC Road with SP Road and Mission Road)

Vehicles		D-1 to D-3	Total Traffic from D-1	D-2 to D-3	D-2 to D-4	Total Traffic from D-2	D-3 to D-1	D-3 to D-4	Total Traffic from D-3	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	2 Wheelers	1538	1538	974	1339	2313	2485	231	2716	6567	50.51%
	Auto Rickshaw	679	679	352	545	897	630	47	677	2253	17.33%
	Car/Jeep/Van	982	982	367	453	820	1145	128	1273	3075	23.65%
	Min-Bus	31	31	15	24	39	37	1	38	108	0.83%
	Std. Bus	180	180	12	38	50	157	132	289	519	3.99%
	LCV	127	127	36	71	107	99	7	106	340	2.62%
	2 Axle Trucks	41	41	17	11	28	46	2	48	117	0.90%
	3 Axle Trucks	0	0	6	0	6	3	0	3	9	0.07%
	MAVs	0	0	0	0	0	0	0	0	0	0.00%
	Tractor With Trailer	0	0	0	0	0	1	0	1	1	0.01%
	Tractor Without Trailer	0	0	0	0	0	0	0	0	0	0.00%
SLOW MOVING VEHICLES	Cycle	1	1	4	4	8	5	0	5	14	0.11%
	Bullock Cart	0	0	0	0	0	0	0	0	0	0.00%
	Horse Drawn Vehicle	0	0	0	0	0	0	0	0	0	0.00%
	Hand Drawn Vehicle	0	0	0	0	0	0	0	0	0	0.00%
Total Vehicles		3581	3581	1782	2484	4266	4606	548	5154	13001	100.00%
Total PCU		4204	4204	1959	2789	4748	4921	701	5622	14574	
Directional Distribution		27.5%	27.5%	13.7%	19.1%	32.8%	35.4%	4.2%	39.6%	100.0%	

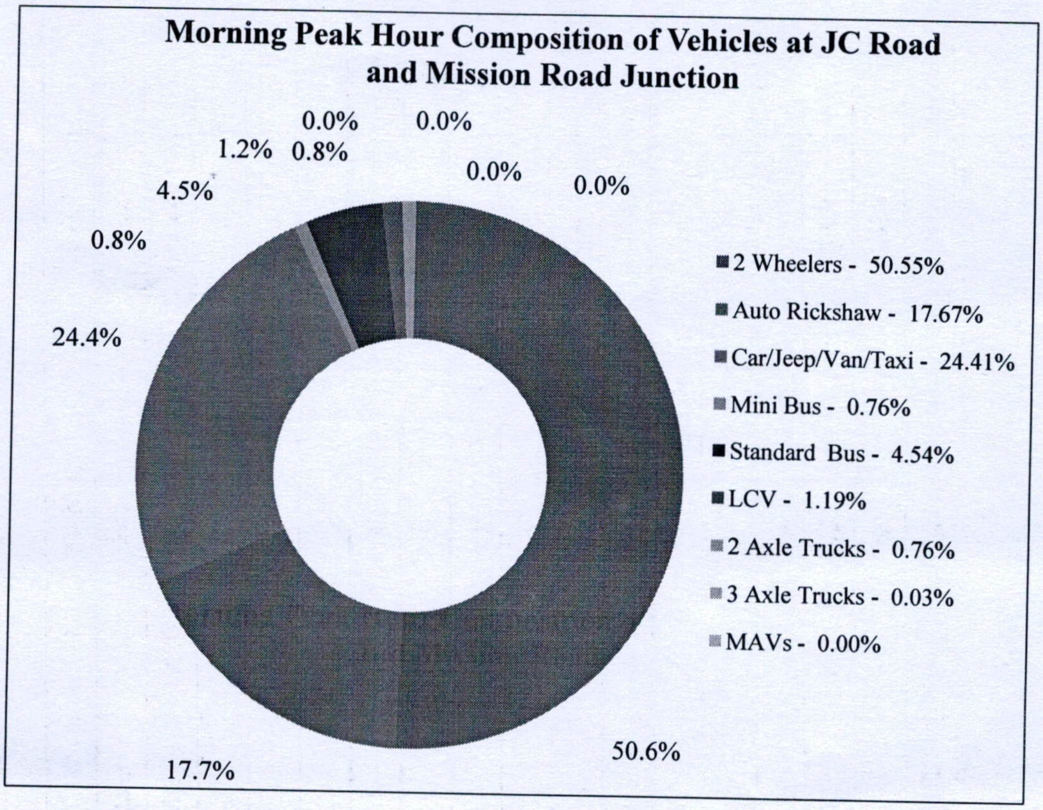


Figure 2-17: Morning Peak Hour Composition at Badami House Junction (JC Road with SP Road and Mission Road)

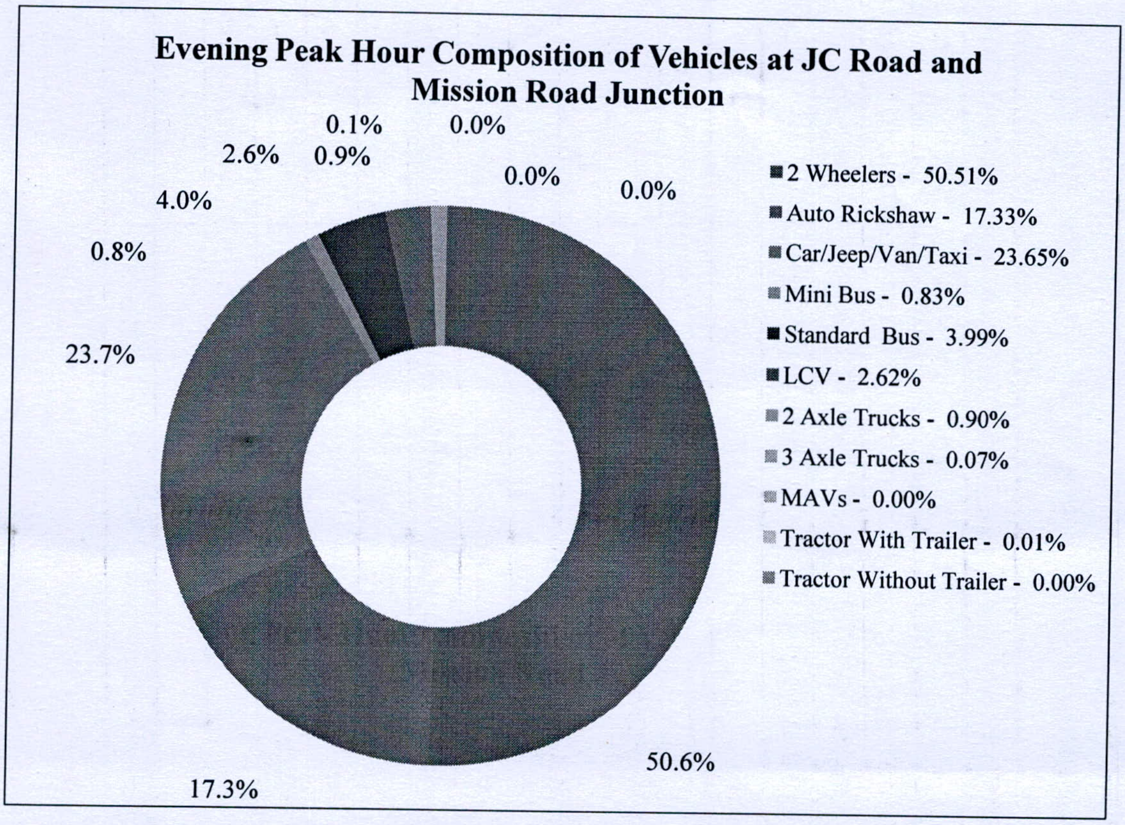


Figure 2-18: Evening Peak Hour Composition at Badami House Junction (JC Road with SP Road and Mission Road)

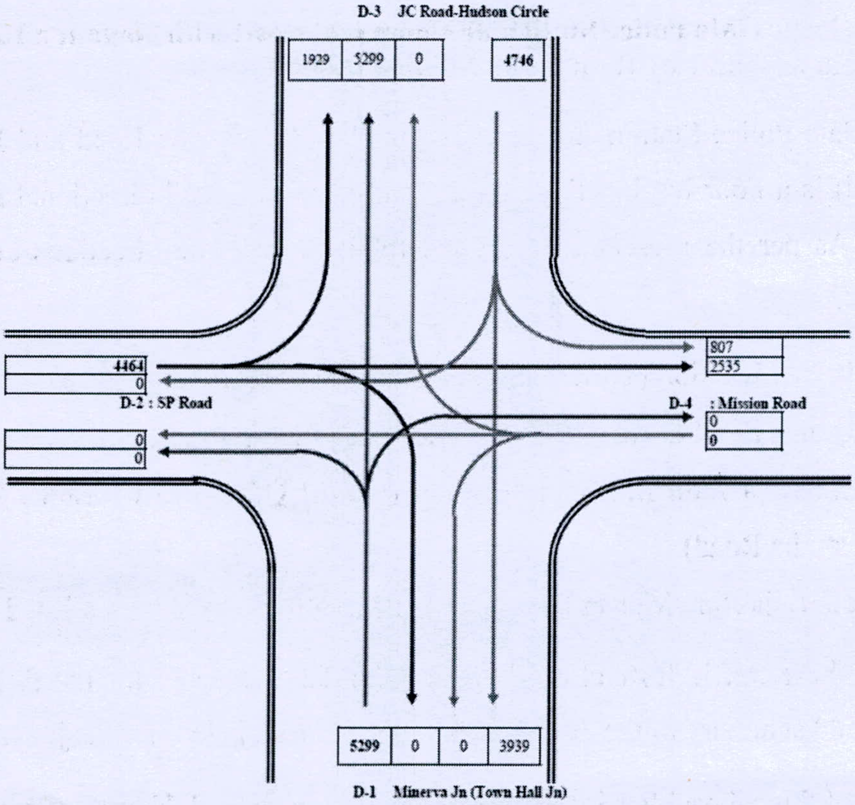


Figure 2-19: Morning Peak Hour Traffic Flow at Badami House Junction (JC Road with SP Road and Mission Road)

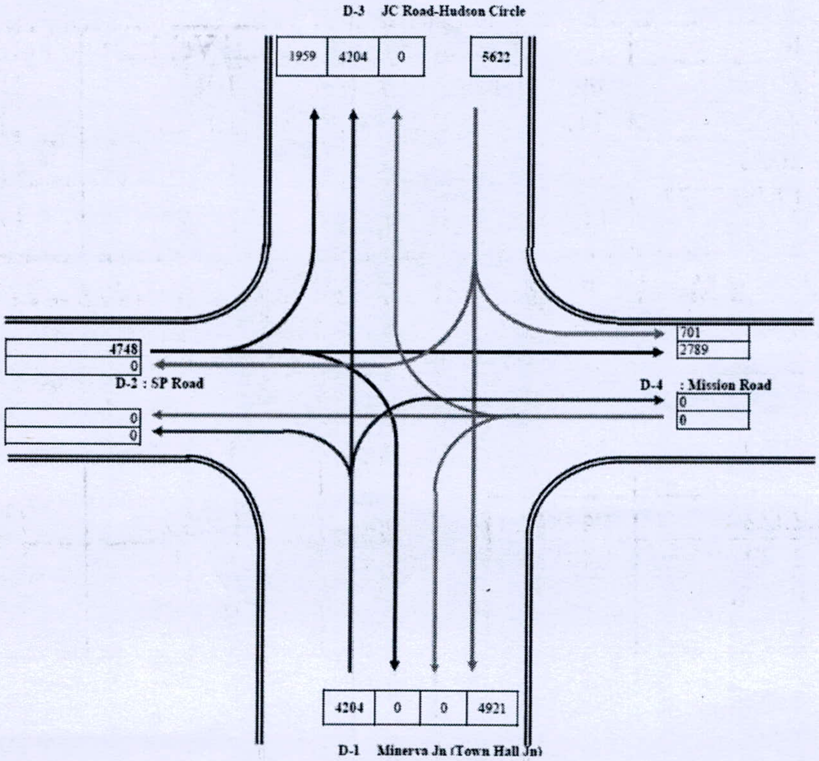


Figure 2-20: Evening Peak Hour Traffic Flow at Badami House Junction (JC Road with SP Road and Mission Road)

2.2.6 Halasur Gate Police Station Junction (JC Road with Naganna Road and Raja Ram Mohan Roy Road)

Halasur Gate Police Station Junction (JC Road with Naganna Road and Raja Ram Mohan Roy Road) is a Four leg junction and presently has restricted directional movements at the junction. As per the present traffic flow, following are the directions allowed for traffic movement.

- Minerva Junction (Town Hall) to Hudson Circle (KG Road / Kasturba Road)
- Naganna Road to Hudson Circle (KG Road / Kasturba Road)
- From Raja Ram Mohan Roy Road (BBMP Office) to Hudson Circle (KG Road / Kasturba Road)
- From Raja Ram Mohan Roy Road (BBMP Office) to Naganna Road

Based on these traffic flow at the junction, the data collected for the three days has been averaged and summary of the data analysis are presented below for the junction.

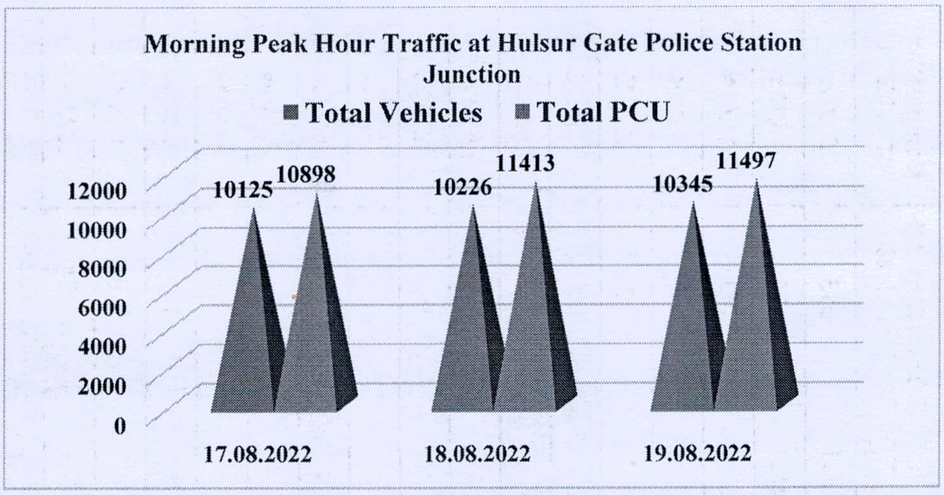
Summary of three days Morning Peak Hour and Evening Peak Hours are presented below.

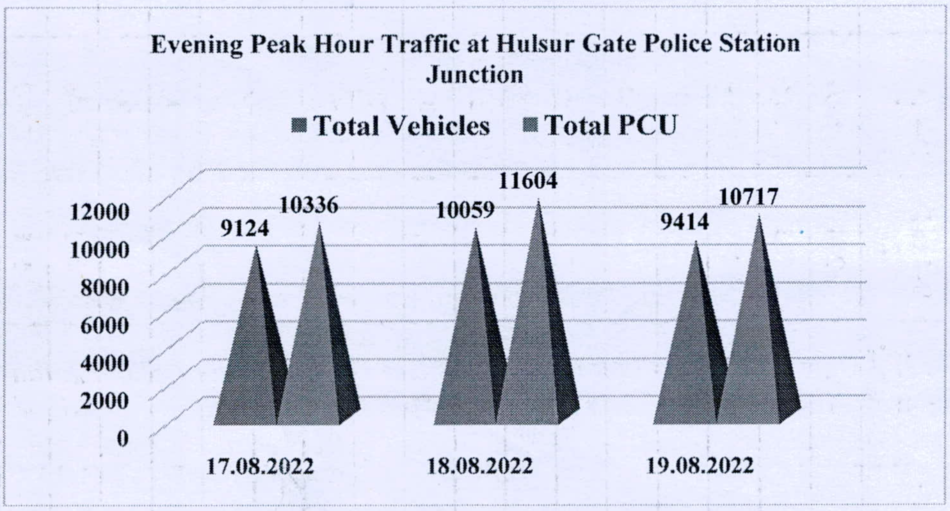
Table 2-23: 3 Days Morning Peak Hour Traffic at Halasur Gate Police Station Junction (JC Road with Naganna Road and Raja Ram Mohan Roy Road)

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	09.00am to 10.00am	10125	10898
18.08.2022	11.00am to 12.00pm	10226	11413
19.08.2022	11.00am to 12.00pm	10345	11497
Average of 17.08.2022 to 19.08.2022	**11.00am to 12.00pm**	**10053**	**11198**

Table 2-24: 3 Days Evening Peak Hour Traffic at Halasur Gate Police Station Junction (JC Road with Naganna Road and Raja Ram Mohan Roy Road)

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	04.00pm to 05.00pm	9124	10336
18.08.2022	04.00pm to 05.00pm	10059	11604
19.08.2022	04.00pm to 05.00pm	9414	10717
Average of 17.08.2022 to 19.08.2022	**04.00pm to 05.00pm**	**9532**	**10885**





Detailed Peak hour traffic details including, directional flow, vehicle types, composition, percentage of directional flow are presented in both tables and graphical representation for ready reference below for both morning peak and evening peak hours.

Table 2-25: Summary of Morning Peak Hour Traffic at Halasur Gate Police Station Junction (JC Road with Naganna Road and Raja Ram Mohan Roy Road)

	Vehicles	D-1 to D-3	Total Traffic from D-1	D-2 to D-3	Total Traffic from D-2	D-4 to D-2	D-4 to D-3	Total Traffic from D-4	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	**2 Wheelers**	3314	**3314**	411	**411**	274	1093	**1368**	**5093**	**50.66%**
	Auto Rickshaw	1047	**1047**	97	**97**	105	378	**483**	**1626**	**16.18%**
	Car/Jeep/Van	1808	**1808**	38	**38**	59	568	**627**	**2473**	**24.60%**
	Min-Bus	99	**99**	0	**0**	2	30	**33**	**132**	**1.31%**
	Std. Bus	296	**296**	0	**0**	0	172	**172**	**469**	**4.66%**
	LCV	72	**72**	10	**10**	21	46	**67**	**150**	**1.49%**
	2 Axle Trucks	78	**78**	1	**1**	0	14	**14**	**93**	**0.93%**
	3 Axle Trucks	2	**2**	0	**0**	0	2	**2**	**4**	**0.04%**
	MAVs	0	**0**	0	**0**	0	0	**0**	**0**	**0.00%**
	Tractor With Trailer	0	**0**	0	**0**	0	0	**0**	**0**	**0.00%**
	Tractor Without Trailer	0	**0**	0	**0**	0	0	**0**	**0**	**0.00%**
SLOW MOVING VEHICLES	**Cycle**	2	**2**	2	**2**	9	0	**9**	**13**	**0.13%**
	Bullock Cart	0	**0**	0	**0**	0	0	**0**	**0**	**0.00%**
	Horse Drawn Vehicle	0	**0**	0	**0**	0	0	**0**	**0**	**0.00%**
	Hand Drawn Vehicle	0	**0**	0	**0**	0	0	**0**	**0**	**0.00%**
Total Vehicles		**6719**	**6719**	**560**	**560**	**470**	**2305**	**2775**	**10053**	**100.00%**
Total PCU		**7460**	**7460**	**558**	**558**	**511**	**2669**	**3180**	**11198**	
Directional Distribution		**66.8%**	**66.8%**	**5.6%**	**5.6%**	**4.7%**	**22.9%**	**27.6%**	**100.0%**	

Table 2-26: Summary of Evening Peak Hour Traffic at Halasur Gate Police Station Junction (JC Road with Naganna Road and Raja Ram Mohan Roy Road)

	Vehicles	D-1 to D-3	Total Traffic from D-1	D-2 to D-3	Total Traffic from D-2	D-4 to D-2	D-4 to D-3	Total Traffic from D-4	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	**2 Wheelers**	2653	**2653**	449	**449**	321	1031	**1352**	**4454**	46.73%
	Auto Rickshaw	1210	**1210**	76	**76**	99	330	**429**	**1714**	17.98%
	(Yellow Board)	1782	**1782**	50	**50**	57	608	**665**	**2498**	26.20%
	Min-Bus	77	**77**	0	**0**	1	22	**23**	**100**	1.05%
	Std. Bus	259	**259**	0	**0**	0	173	**173**	**432**	4.53%
	LCV	109	**109**	7	**7**	18	108	**126**	**242**	2.54%
	2 Axle Trucks	54	**54**	1	**1**	0	15	**15**	**70**	0.73%
	3 Axle Trucks	4	**4**	0	**0**	0	3	**3**	**8**	0.08%
	MAVs	0	**0**	0	**0**	0	0	**0**	**0**	0.00%
	Tractor With Trailer	0	**0**	0	**0**	0	0	**0**	**0**	0.00%
	Tractor Without Trailer	0	**0**	0	**0**	0	0	**0**	**0**	0.00%
SLOW MOVING VEHICLES	**Cycle**	5	**5**	1	**1**	9	1	**9**	**15**	0.16%
	Bullock Cart	0	**0**	0	**0**	0	0	**0**	**0**	0.00%
	Horse Drawn Vehicle	0	**0**	0	**0**	0	0	**0**	**0**	0.00%
	Hand Drawn Vehicle	0	**0**	0	**0**	0	0	**0**	**0**	0.00%
Total Vehicles		**6154**	**6154**	**583**	**583**	**504**	**2291**	**2795**	9532	**100.00%**
Total PCU		**7160**	**7160**	**550**	**550**	**525**	**2650**	**3175**	**10885**	
Directional Distribution		**64.6%**	**64.6%**	**6.1%**	**6.1%**	**5.3%**	**24.0%**	**29.3%**	**100.0%**	

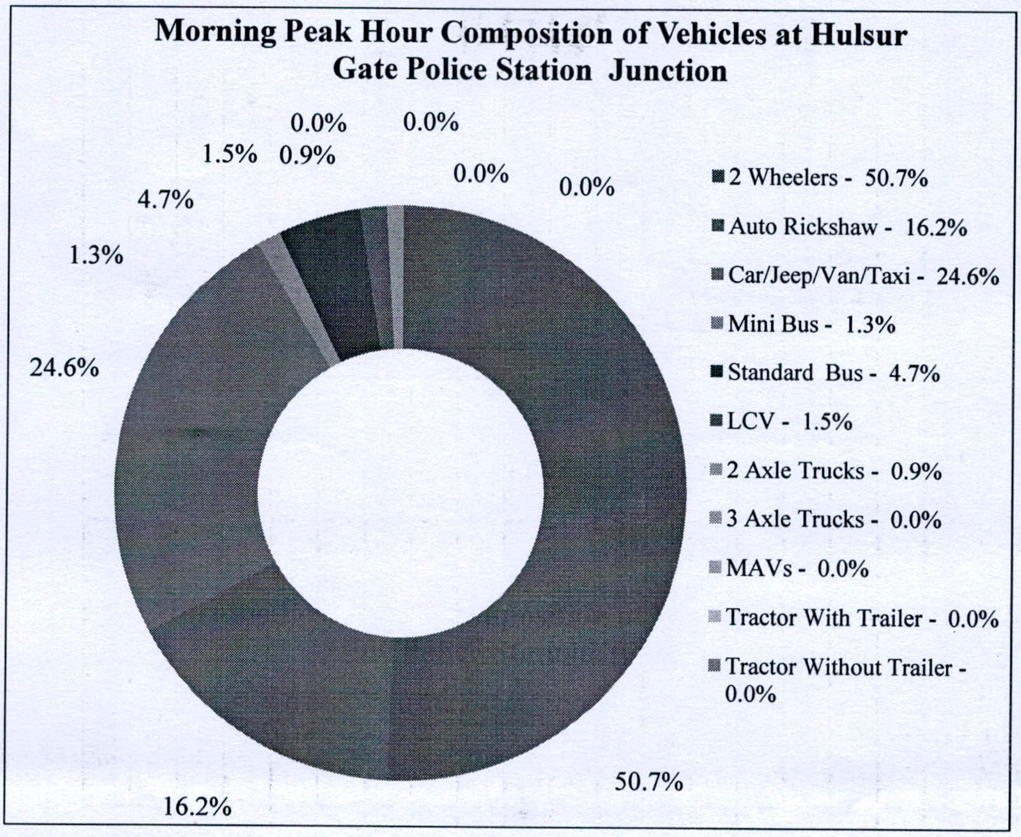


Figure 2-21: Morning Peak Hour Composition at Halasur Gate Police Station Junction (JC Road with Naganna Road and Raja Ram Mohan Roy Road)

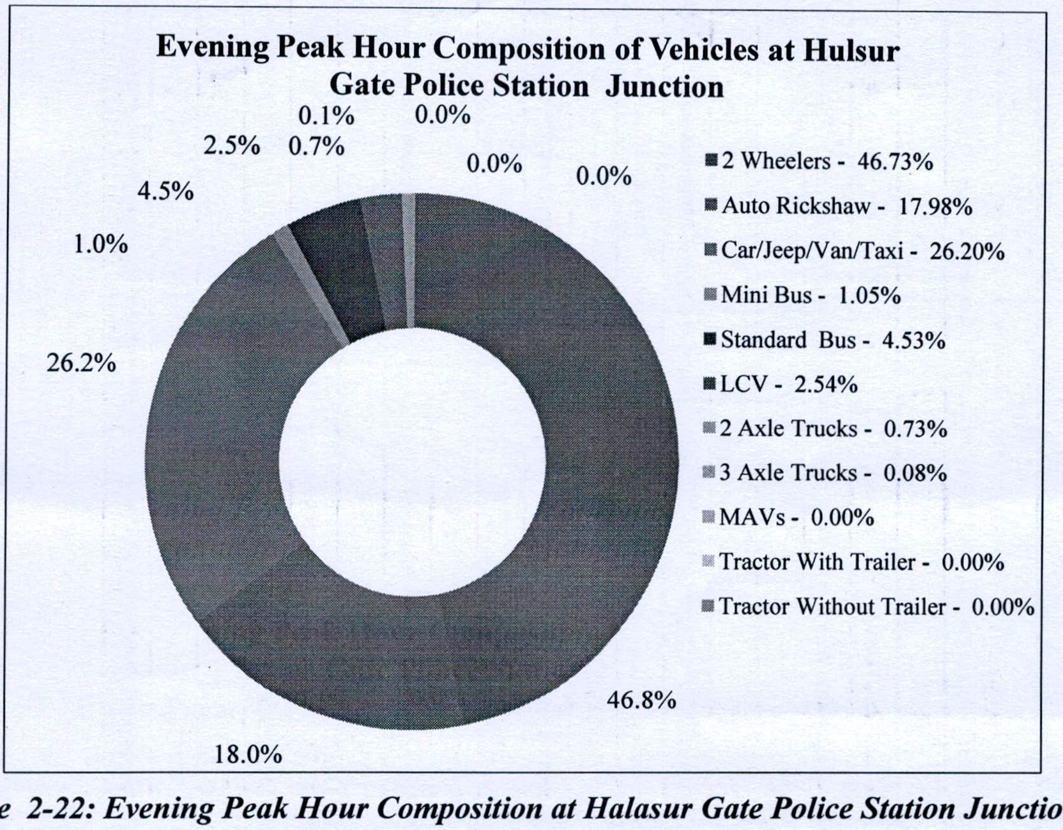


Figure 2-22: Evening Peak Hour Composition at Halasur Gate Police Station Junction (JC Road with Naganna Road and Raja Ram Mohan Roy Road)

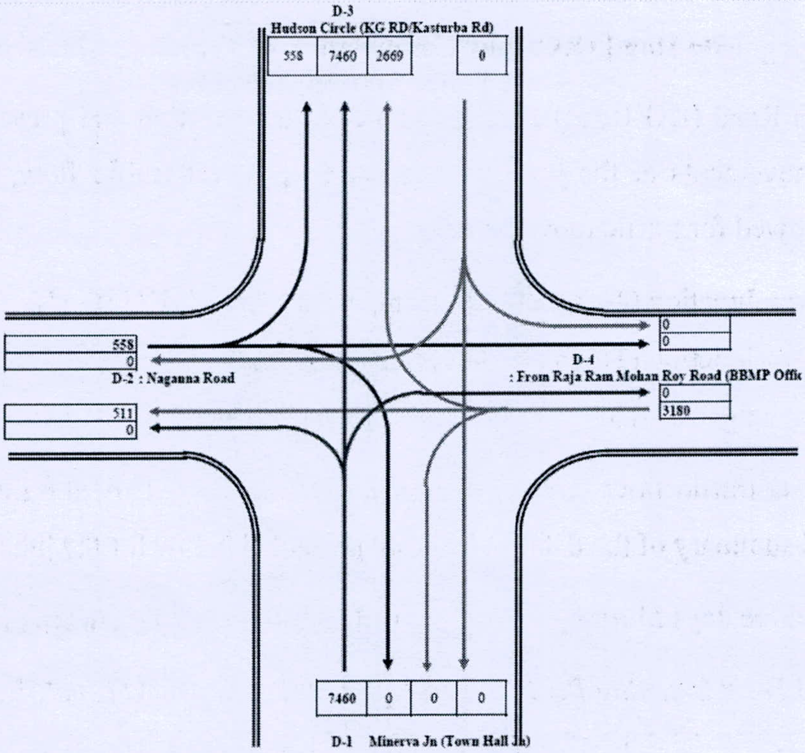

D-3
Hudson Circle (KG RD/Kasturba Rd)
558
7460
2669
0
558
0
D-2 : Naganna Road
511
0
0
0
D-4
: From Raja Ram Mohan Roy Road (BBMP Offic
0
3180
7460
0
0
0
D-1 Minerva Jn (Town Hall Jn)

Figure 2-23: Morning Peak Hour Traffic Flow at Halasur Gate Police Station Junction (JC Road with Naganna Road and Raja Ram Mohan Roy Road)

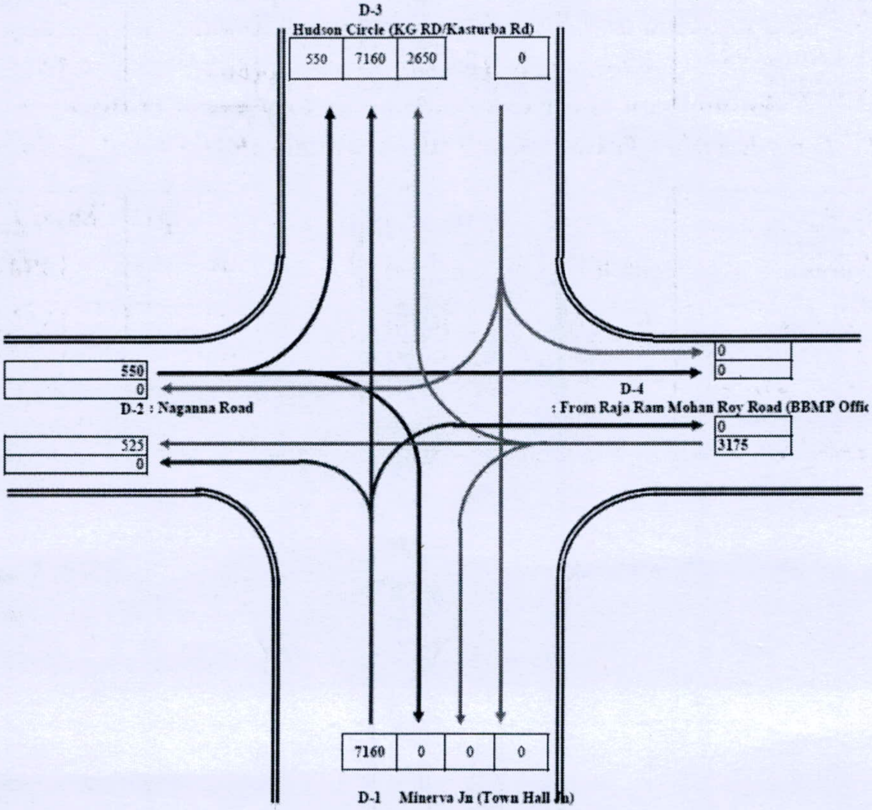

D-3
Hudson Circle (KG RD/Kasturba Rd)
550
7160
2650
0
550
0
D-2 : Naganna Road
525
0
0
0
D-4
: From Raja Ram Mohan Roy Road (BBMP Offic
0
3175
7160
0
0
0
D-1 Minerva Jn (Town Hall Jn)

Figure 2-24: Evening Peak Hour Traffic Flow at Halasur Gate Police Station Junction (JC Road with Naganna Road and Raja Ram Mohan Roy Road)

2.2.7 Kempegowda Road (KG Road) Junction

Kempegowda Road (KG Road) Junction is a Four leg junction and presently has restricted directional movements at the junction. As per the present traffic flow, following are the directions allowed for traffic movement.

- Minerva Junction (Town Hall) to Kempegowda Road (KG Road)
- Minerva Junction (Town Hall) to Kasturba Road
- Nrupathunga Road to Kasthurba Road/Lalbagh Road/K R Market

Based on these traffic flow at the junction, the data collected for the three days has been averaged and summary of the data analysis are presented below for the junction.

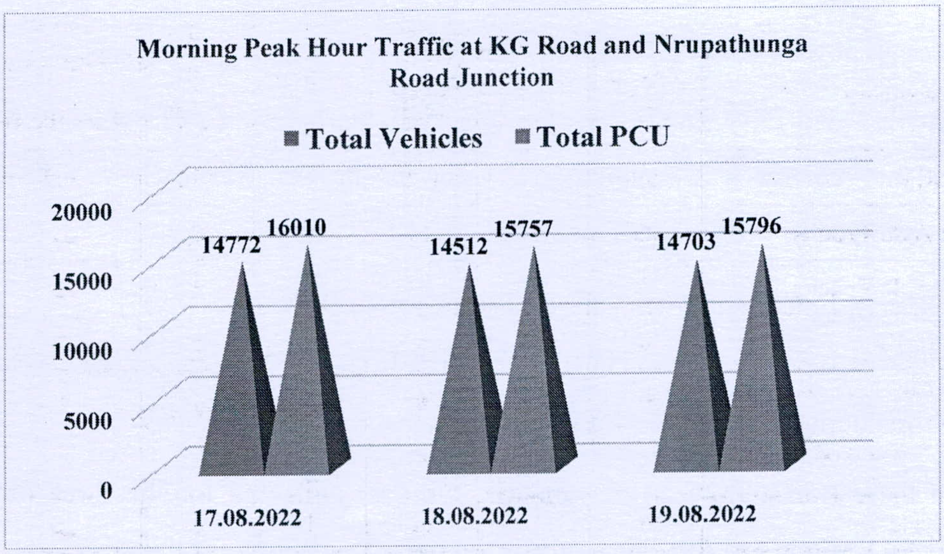
Summary of three days Morning Peak Hour and Evening Peak Hours are presented below.

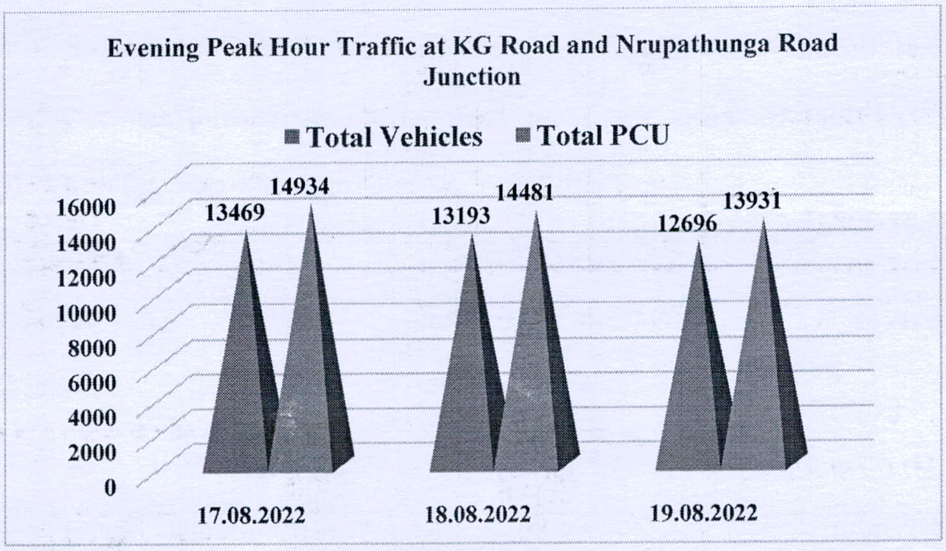
Table 2-27: 3 Days Morning Peak Hour Traffic at Kempegowda Road (KG Road) Junction

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	09.00am to 10.00am	14772	16010
18.08.2022	09.00am to 10.00am	14512	15757
19.08.2022	09.00am to 10.00am	14703	15796
Average of 17.08.2022 to 19.08.2022	**09.00am to 10.00am**	**14662**	**15854**

Table 2-28: 3 Days Evening Peak Hour Traffic at Kempegowda Road (KG Road) Junction

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	04.00pm to 05.00pm	13469	14934
18.08.2022	04.00pm to 05.00pm	13193	14481
19.08.2022	04.00pm to 05.00pm	12696	13931
Average of 17.08.2022 to 19.08.2022	**04.00pm to 05.00pm**	**13119**	**14449**





Detailed Peak hour traffic details including, directional flow, vehicle types, composition, percentage of directional flow are presented in both tables and graphical representation for ready reference below for both morning peak and evening peak hours.

Table 2-29: Summary of Morning Peak Hour Traffic at Kempegowda Road (KG Road) Junction Minerva Junction

Vehicles		D-1 to D-2	D-1 to D-4	Total Traffic from D-1	D-3 to D-4	Total Traffic from D-3	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	**2 Wheelers**	2360	2650	**5011**	2752	**2752**	**7762**	**52.94%**
	Auto Rickshaw	937	550	**1487**	558	**558**	**2045**	**13.95%**
	Car/Jeep/Van	1278	1038	**2316**	1380	**1380**	**3696**	**25.21%**
	Min-Bus	48	30	**78**	19	**19**	**97**	**0.66%**
	Std. Bus	187	201	**388**	288	**288**	**676**	**4.61%**

Vehicles		D-1 to D-2	D-1 to D-4	Total Traffic from D-1	D-3 to D-4	Total Traffic from D-3	Total from All Directions	Composition of Vehicles
	LCV	99	89	**188**	114	**114**	**302**	**2.06%**
	2 Axle Trucks	24	20	**43**	7	**7**	**51**	**0.35%**
	3 Axle Trucks	2	18	**20**	1	**1**	**21**	**0.14%**
	MAVs	0	0	**0**	0	**0**	**0**	**0.00%**
	Tractor With Trailer	0	0	**0**	1	**1**	**1**	**0.00%**
	Tractor Without Trailer	0	0	**0**	0	**0**	**0**	**0.00%**
SLOW MOVING VEHICLES	Cycle	6	5	**11**	1	**1**	**13**	**0.09%**
	Bullock Cart	0	0	**0**	0	**0**	**0**	**0.00%**
	Horse Drawn Vehicle	0	0	**0**	0	**0**	**0**	**0.00%**
	Hand Drawn Vehicle	0	0	**0**	0	**0**	**0**	**0.00%**
Total Vehicles		**4942**	**4601**	**9543**	**5119**	**5119**	**14662**	**100.00%**
Total PCU		**5604**	**4851**	**10455**	**5399**	**5399**	**15854**	
Directional Distribution		**33.7%**	**31.4%**	**65.1%**	**34.9%**	**34.9%**	**100.0%**	

Table 2-30: Summary of Evening Peak Hour Traffic at Kempegowda Road (KG Road) Junction Minerva Junction

Vehicles		D-1 to D-2	D-1 to D-4	Total Traffic from D-1	D-3 to D-4	Total Traffic from D-3	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	2 Wheelers	2161	1784	**3945**	2720	**2720**	**6665**	50.81%
	Auto Rickshaw	856	688	**1544**	542	**542**	**2086**	15.90%
	Car/Jeep/Van	1251	1053	**2304**	1028	**1028**	**3332**	25.40%
	Min-Bus	29	76	**105**	21	**21**	**126**	0.96%
	Std. Bus	246	77	**324**	196	**196**	**520**	3.96%
	LCV	143	48	**191**	105	**105**	**296**	2.26%
	2 Axle Trucks	31	19	**50**	18	**18**	**68**	0.52%
	3 Axle Trucks	5	6	**11**	1	**1**	**12**	0.09%
	MAVs	2	0	**2**	0	**0**	**2**	0.02%
	Tractor With Trailer	0	0	**0**	0	**0**	**0**	0.00%
	Tractor Without Trailer	0	0	**0**	0	**0**	**0**	0.00%

Vehicles		D-1 to D-2	D-1 to D-4	Total Traffic from D-1	D-3 to D-4	Total Traffic from D-3	Total from All Directions	Composition of Vehicles
SLOW MOVING VEHICLES	**Cycle**	4	5	**9**	2	**2**	**11**	0.09%
	Bullock Cart	0	0	**0**	0	**0**	**0**	0.00%
	Horse Drawn Vehicle	0	0	**0**	0	**0**	**0**	0.00%
	Hand Drawn Vehicle	0	0	**0**	0	**0**	**0**	0.00%
Total Vehicles		**4729**	**3757**	**8486**	**4634**	**4634**	**13119**	**100.00%**
Total PCU		**5464**	**4178**	**9643**	**4806**	**4806**	**14449**	
Directional Distribution		**36.0%**	**28.6%**	**64.7%**	**35.3%**	**35.3%**	**100.0%**	

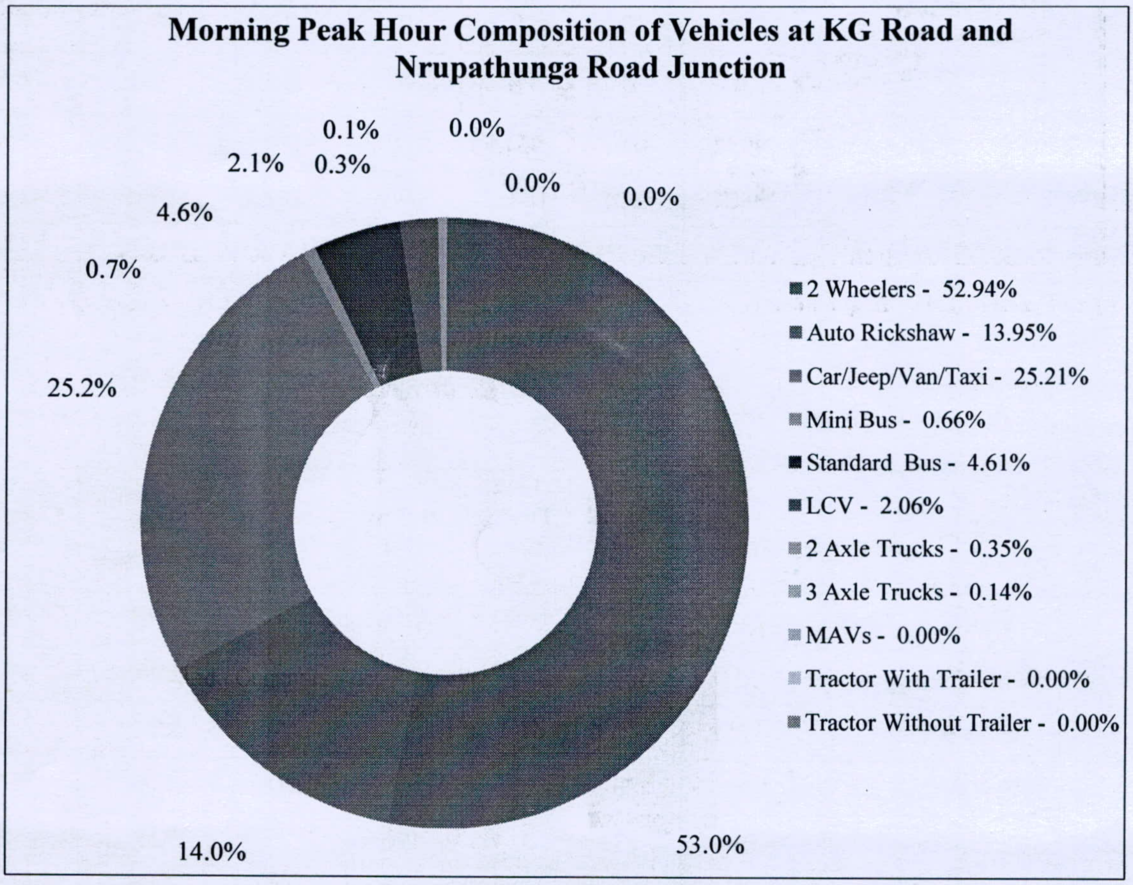


Figure 2-25: Morning Peak Hour Composition at Kempegowda Road (KG Road) Junction

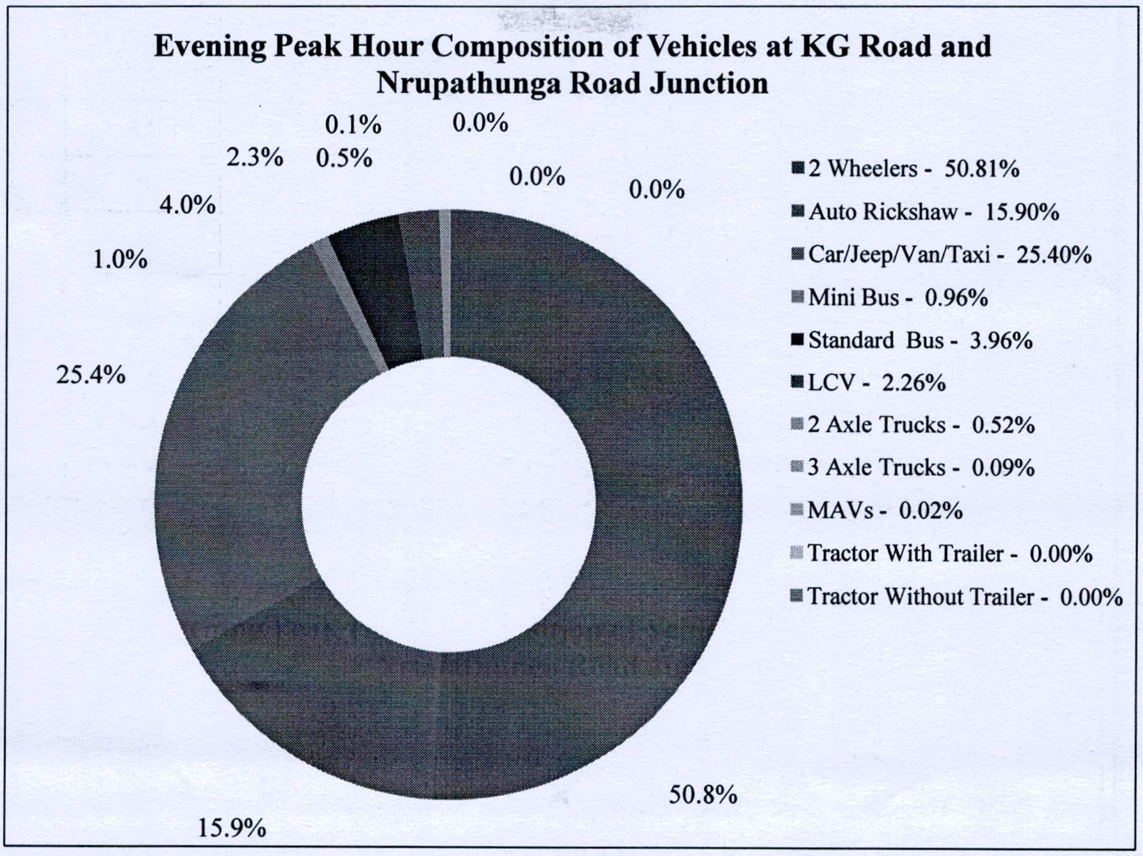


Figure 2-26: Evening Peak Hour Composition at Kempegowda Road (KG Road) Junction

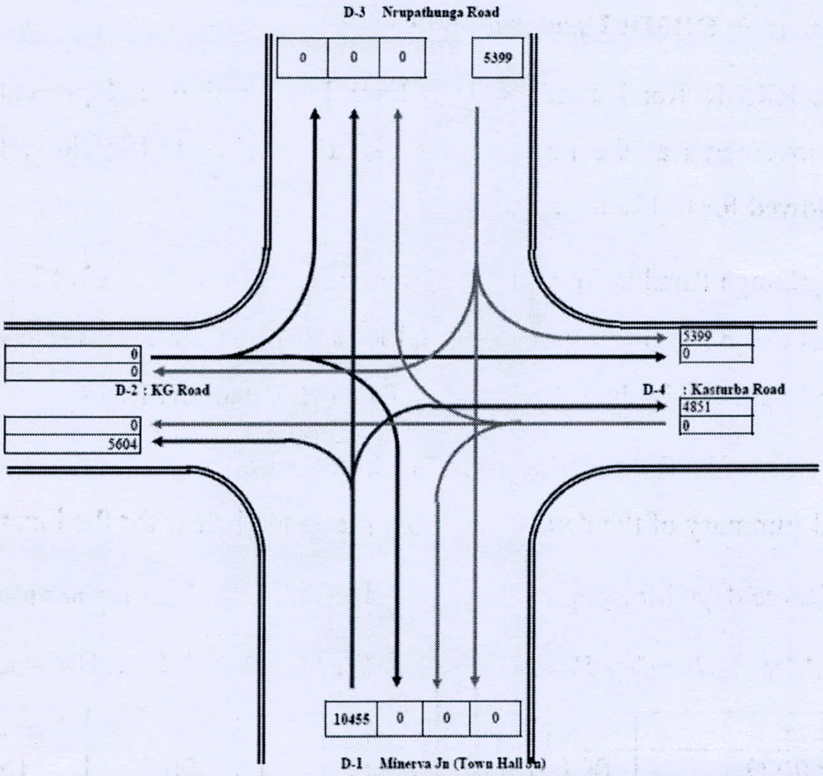


Figure 2-27: Morning Peak Hour Traffic Flow at Kempegowda Road (KG Road) Junction

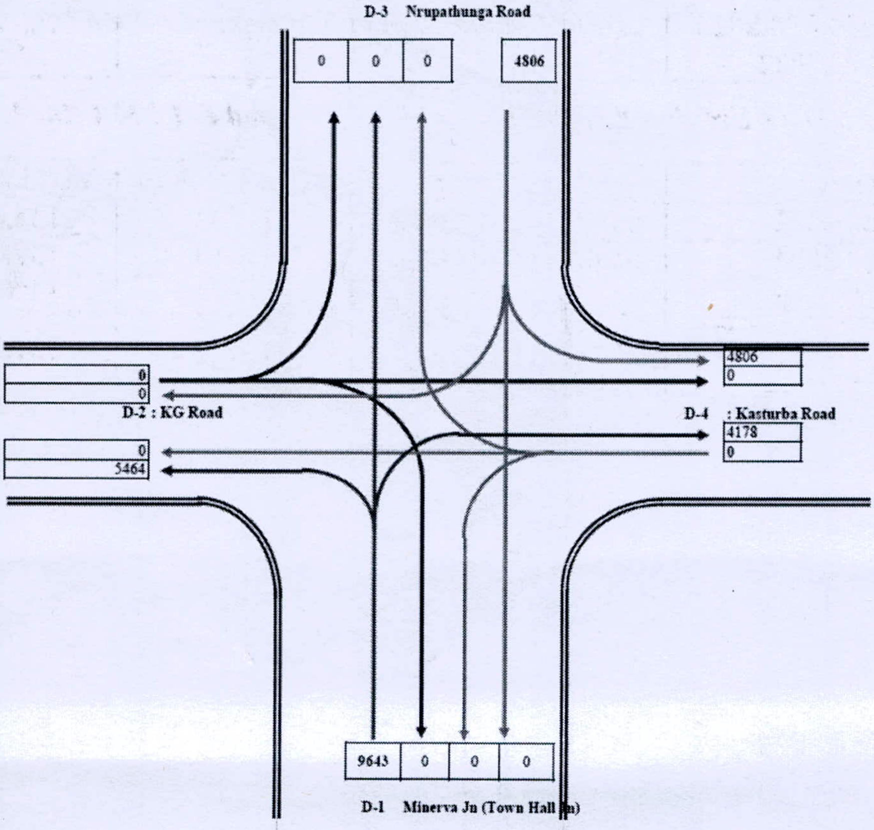


Figure 2-28: Evening Peak Hour Traffic Flow at Kempegowda Road (KG Road) Junction

2.2.8 NR Road & RRMR Road Junction

NR Road & RRMR Road Junction is a Four leg junction and presently has restricted directional movements at the junction. As per the present traffic flow, following are the directions allowed for traffic movement.

- Nrupathunga Road to Town Hall /Minerva Junction /K R Market/Lalbagh Road
- Nrupathunga Road to Devanga Hostel Road (to Mission Road)
- From Raja Ram Mohan Roy Road to Town Hall and KG Road

Based on these traffic flow at the junction, the data collected for the three days has been averaged and summary of the data analysis are presented below for the junction.

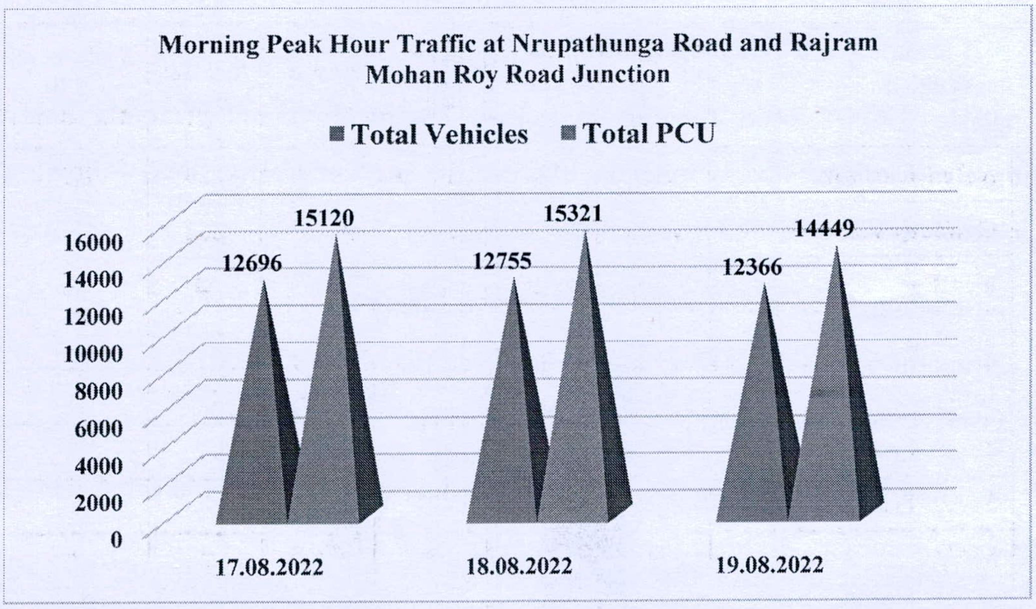
Summary of three days Morning Peak Hour and Evening Peak Hours are presented below.

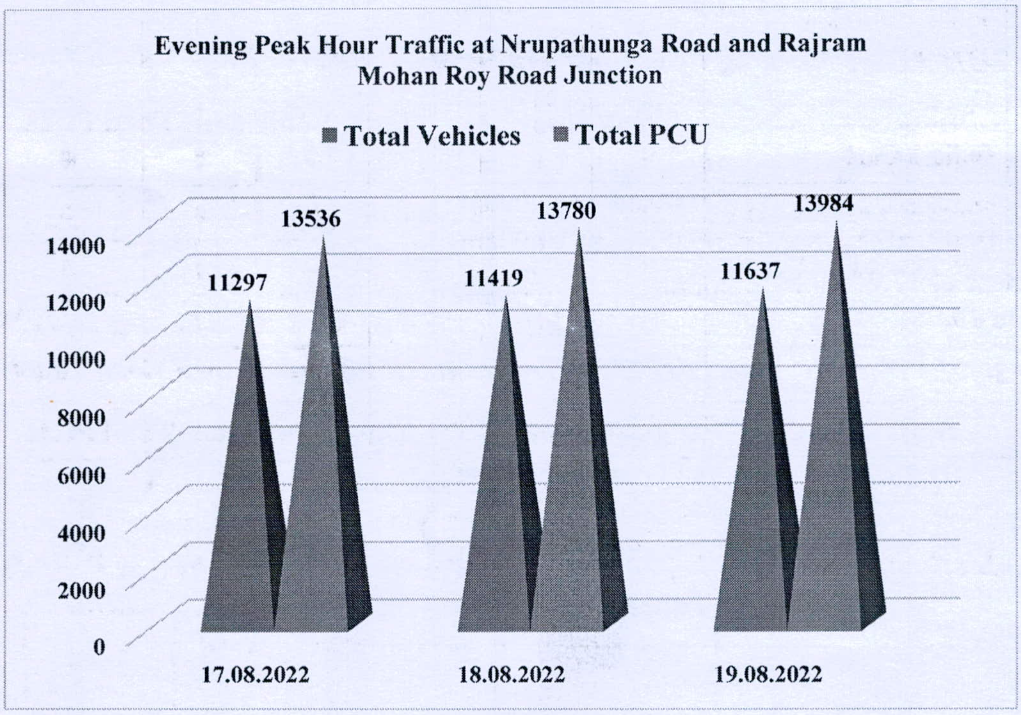
Table 2-31: 3 Days Morning Peak Hour Traffic at NR Road & RRMR Road Junction

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	09.00am to 10.00am	12696	15120
18.08.2022	09.00am to 10.00am	12755	15321
19.08.2022	09.00am to 10.00am	12366	14449
Average of 17.08.2022 to 19.08.2022	**09.00am to 10.00am**	**12606**	**14964**

Table 2-32: 3 Days Evening Peak Hour Traffic at NR Road & RRMR Road Junction

Date	Peak Hour	Total Vehicles	Total PCU
17.08.2022	04.00pm to 05.00pm	11297	13536
18.08.2022	04.00pm to 05.00pm	11419	13780
19.08.2022	04.00pm to 05.00pm	11637	13984
Average of 17.08.2022 to 19.08.2022	**04.00pm to 05.00pm**	**11451**	**13767**





Detailed Peak hour traffic details including, directional flow, vehicle types, composition, percentage of directional flow are presented in both tables and graphical representation for ready reference below for both morning peak and evening peak hours.

Table 2-33: Summary of Morning Peak Hour Traffic at NR Road & RRMR Road Junction

	Vehicles	D-2 to D-1	D-2 to D-4	Total Traffic from D-2	D-3 to D-1	Total Traffic from D-3	Total from All Directions	Composition of Vehicles
MOVING VE	2 Wheelers	1876	2119	**3995**	1866	**1866**	**5861**	**46.49%**

	Vehicles	D-2 to D-1	D-2 to D-4	Total Traffic from D-2	D-3 to D-1	Total Traffic from D-3	Total from All Directions	Composition of Vehicles
	Auto Rickshaw	345	777	**1122**	629	**629**	**1751**	**13.89%**
	Car/Jeep/Van	2368	713	**3081**	802	**802**	**3883**	**30.80%**
	Min-Bus	47	10	**56**	21	**21**	**77**	**0.61%**
	Std. Bus	503	17	**520**	144	**144**	**664**	**5.27%**
	LCV	192	26	**218**	51	**51**	**269**	**2.13%**
	2 Axle Trucks	23	13	**36**	33	**33**	**70**	**0.55%**
	3 Axle Trucks	16	2	**18**	3	**3**	**21**	**0.16%**
	MAVs	0	0	**0**	0	**0**	**0**	**0.00%**
	Tractor With Trailer	0	0	**0**	0	**0**	**0**	**0.00%**
	Tractor Without Trailer	0	0	**0**	0	**0**	**0**	**0.00%**
SLOW MOVING VEHICLES	**Cycle**	6	1	**7**	2	**2**	**10**	**0.08%**
	Bullock Cart	0	0	**0**	0	**0**	**0**	**0.00%**
	Horse Drawn Vehicle	0	0	**0**	0	**0**	**0**	**0.00%**
	Hand Drawn Vehicle	0	0	**0**	0	**0**	**0**	**0.00%**
Total Vehicles		**5375**	**3678**	**9053**	**3552**	**3552**	**12606**	**100.00%**
Total PCU		**6777**	**4008**	**10784**	**4179**	**4179**	**14964**	
Directional Distribution		**42.6%**	**29.2%**	**71.8%**	**28.2%**	**28.2%**	**100.0%**	

Table 2-34: Summary of Evening Peak Hour Traffic at NR Road & RRMR Road Junction

	Vehicles	D-2 to D-1	D-2 to D-4	Total Traffic from D-2	D-3 to D-1	Total Traffic from D-3	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	**2 Wheelers**	1973	1092	**3065**	1718	**1718**	**4783**	41.77%
	Auto Rickshaw	396	541	**937**	566	**566**	**1503**	13.12%
	Car/Jeep/Van	2222	700	**2922**	959	**959**	**3881**	33.89%
	Min-Bus	107	13	**120**	14	**14**	**134**	1.17%
	Std. Bus	390	6	**396**	200	**200**	**596**	5.20%
	LCV	187	56	**242**	178	**178**	**420**	3.67%
	2 Axle Trucks	41	17	**58**	52	**52**	**110**	0.96%
	3 Axle Trucks	10	2	**12**	3	**3**	**15**	0.13%

Vehicles		D-2 to D-1	D-2 to D-4	Total Traffic from D-2	D-3 to D-1	Total Traffic from D-3	Total from All Directions	Composition of Vehicles
	MAVs	0	0	**0**	0	**0**	**0**	0.00%
	Tractor With Trailer	0	2	**2**	0	**0**	**2**	0.02%
	Tractor Without Trailer	0	0	**0**	0	**0**	**0**	0.00%
SLOW MOVING VEHICLES	**Cycle**	5	1	**6**	2	**2**	**8**	0.07%
	Bullock Cart	0	0	**0**	0	**0**	**0**	0.00%
	Horse Drawn Vehicle	0	0	**0**	0	**0**	**0**	0.00%
	Hand Drawn Vehicle	0	0	**0**	0	**0**	**0**	0.00%
Total Vehicles		**5329**	**2431**	**7760**	**3691**	**3691**	**11451**	**100.00%**
Total PCU		**6477**	**2775**	**9253**	**4514**	**4514**	**13767**	
Directional Distribution		**46.5%**	**21.2%**	**67.8%**	**32.2%**	**32.2%**	**100.0%**	

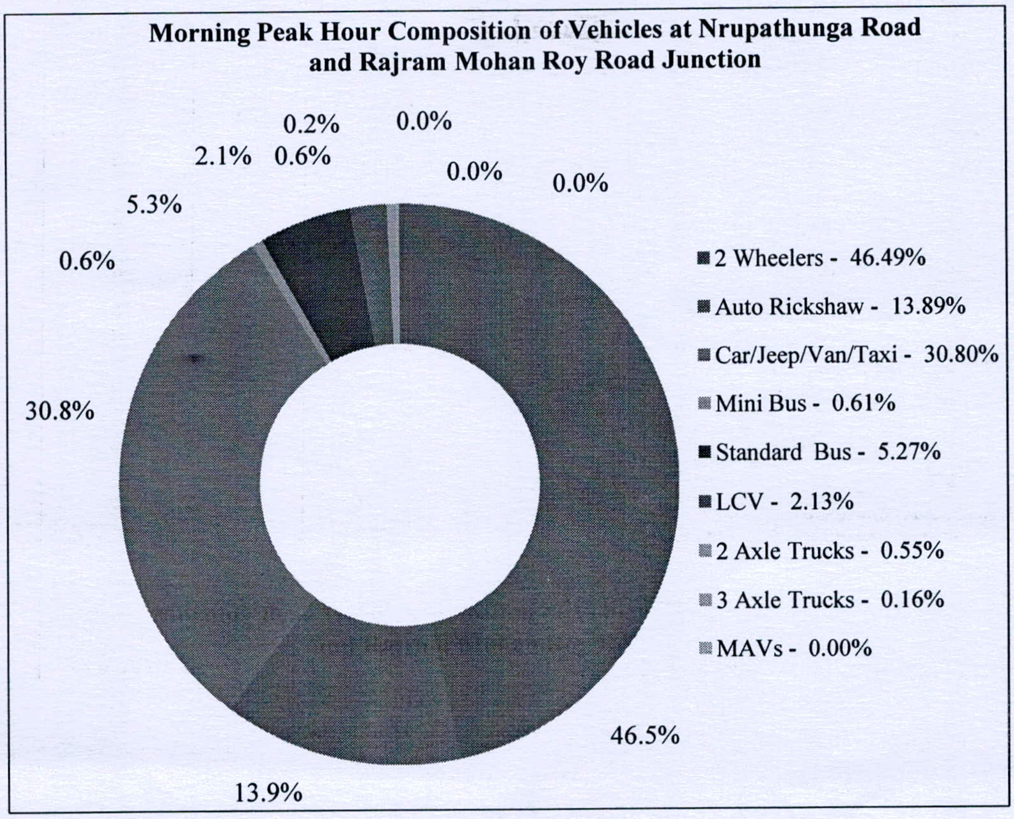


Figure 2-29: Morning Peak Hour Composition at NR Road & RRMR Road Junction

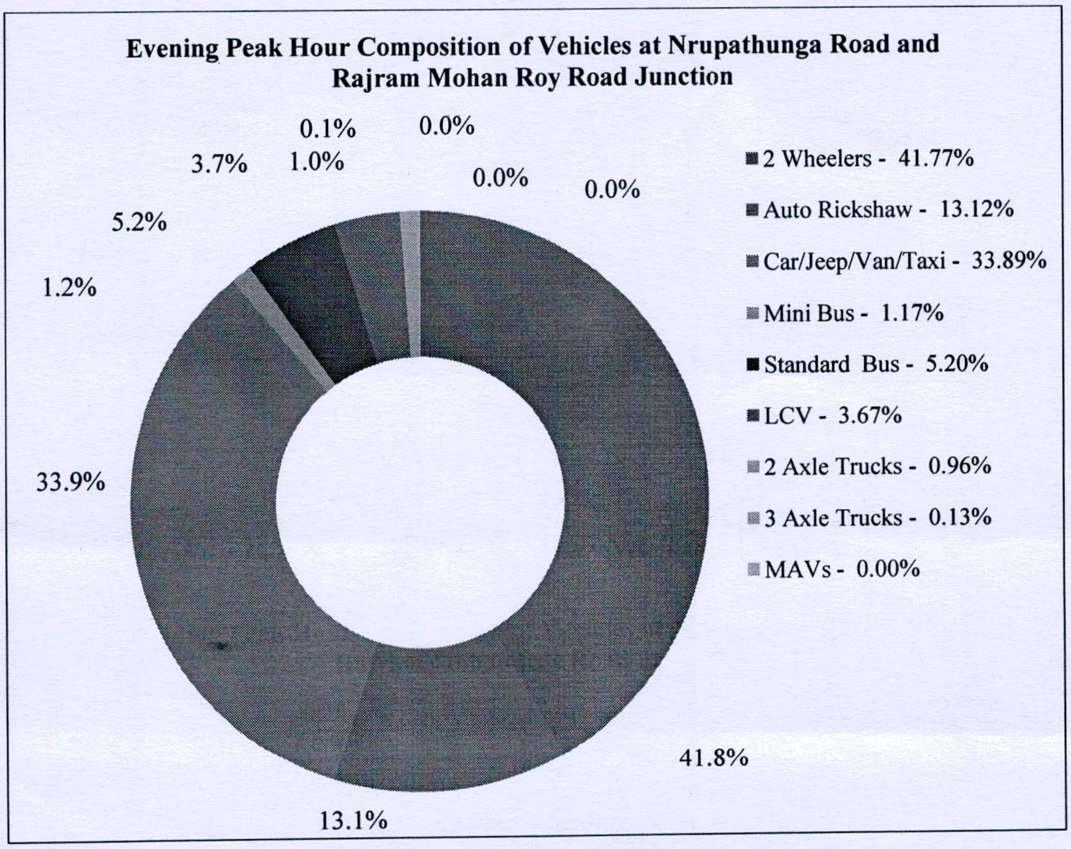


Figure 2-30: Evening Peak Hour Composition at NR Road & RRMR Road Junction

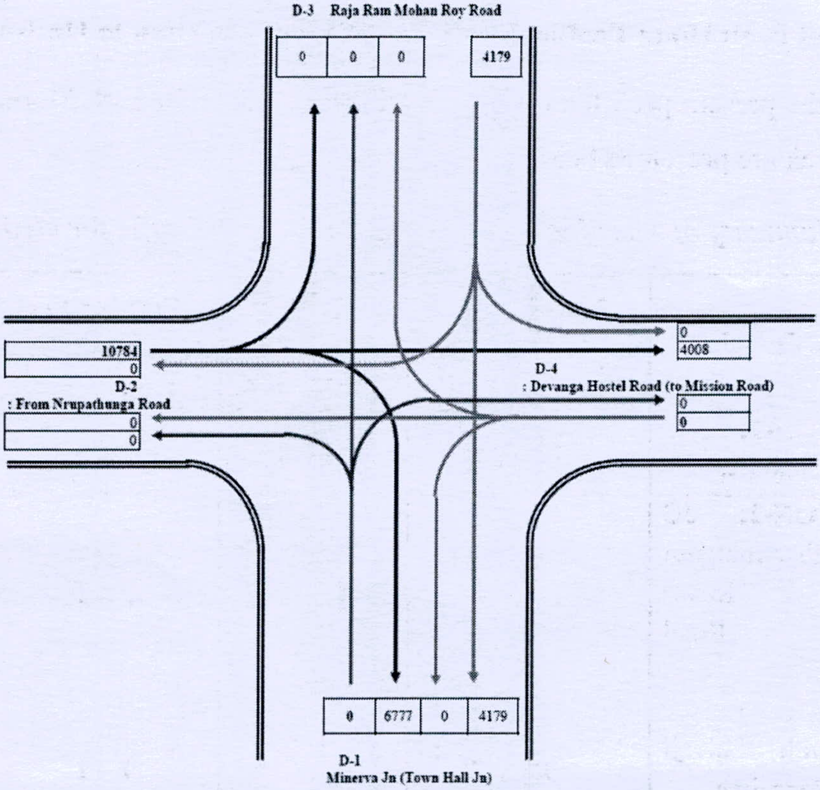

D-3 Raja Ram Mohan Roy Road
0
0
0
4179
10784
0
D-2
: From Nrupathunga Road
0
0
0
4008
D-4
: Devanga Hostel Road (to Mission Road)
0
0
0
6777
0
4179
D-1
Minerva Jn (Town Hall Jn)

Figure 2-31: Morning Peak Hour Traffic Flow at NR Road & RRMR Road Junction

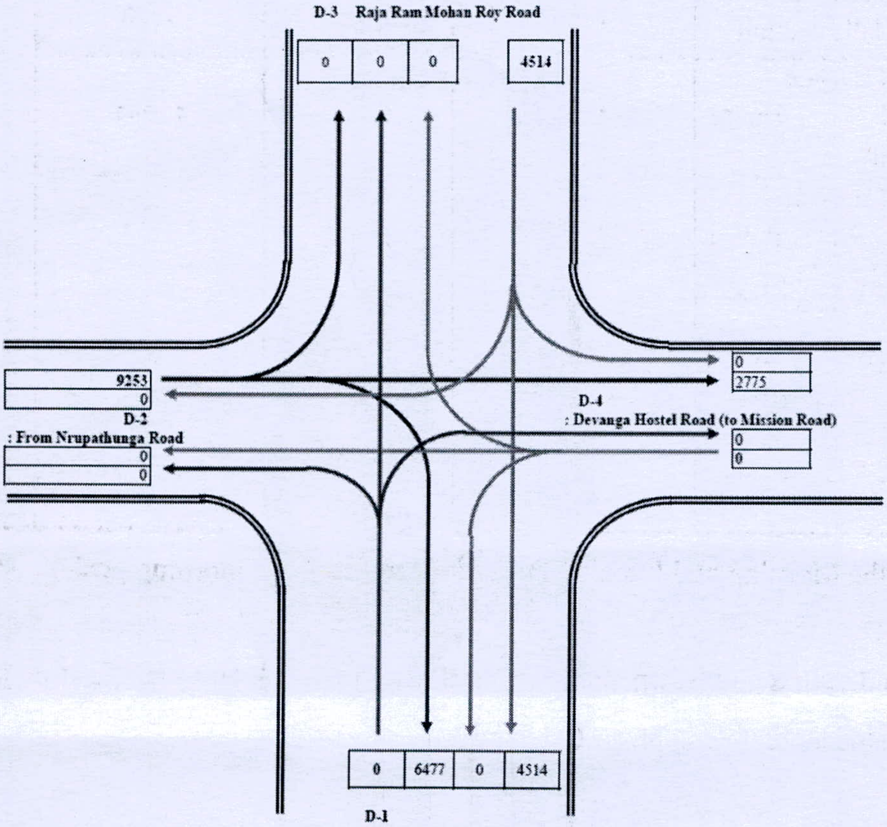

D-3 Raja Ram Mohan Roy Road
0
0
0
4514
9253
0
D-2
: From Nrupathunga Road
0
0
0
2775
D-4
: Devanga Hostel Road (to Mission Road)
0
0
0
6477
0
4514
D-1
Minerva Jn (Town Hall Jn)

Figure 2-32: Evening Peak Hour Traffic Flow at NR Road & RRMR Road Junction

2.2.9 Present Peak Hour Traffic Flow from Minerva Junction to Hudson Circle

Summary of the present peak hour traffic at all the junctions for both Morning Peak as well as Evening Peak are presented below.

Table 2-35: Summary of Morning and Evening Peak Hour Traffic for all Junctions

No	Name of Junctions	Morning Peak Hour Traffic		Evening Peak Hour Traffic	
		Total Vehicles	Total PCU	Total Vehicles	Total PCU
1	**JUNCTION-1:** Minerva Junction	**12094**	**12760**	**9039**	**10455**
2	**JUNCTION-2:** JC Road with Armugum Mudaliar Road-Siddaiah Road Junction	**11050**	**11704**	**9911**	**10954**
3	**JUNCTION-3:** JC Road with Shivaji Talkies-Poornima Theatre Junction	**9608**	**10700**	**7561**	**8271**
4	**JUNCTION-4:** Town Hall Junction	**10524**	**13286**	**9758**	**11800**
5	**JUNCTION-5:** Badami House Junction	**12923**	**14508**	**13001**	**14574**
6	**JUNCTION-6:** Halasur Gate Police Station Junction	**10053**	**11198**	**9532**	**10885**
7	**JUNCTION-7:** Kempegowda Road (KG Road) Junction	**14662**	**15854**	**13119**	**14449**
8	**JUNCTION-8:** NR Road & RRMR Road Junction	**12606**	**14964**	**11451**	**13767**

Comparing the Morning and Evening Peak Hour traffic flow, morning peak hour is maximum for most of the locations. Hence, morning peak hour traffic details have been considered for further consideration and justification. Overall Morning Peak Hour traffic flow from Minerva Junction to Hudson Circle is presented below.

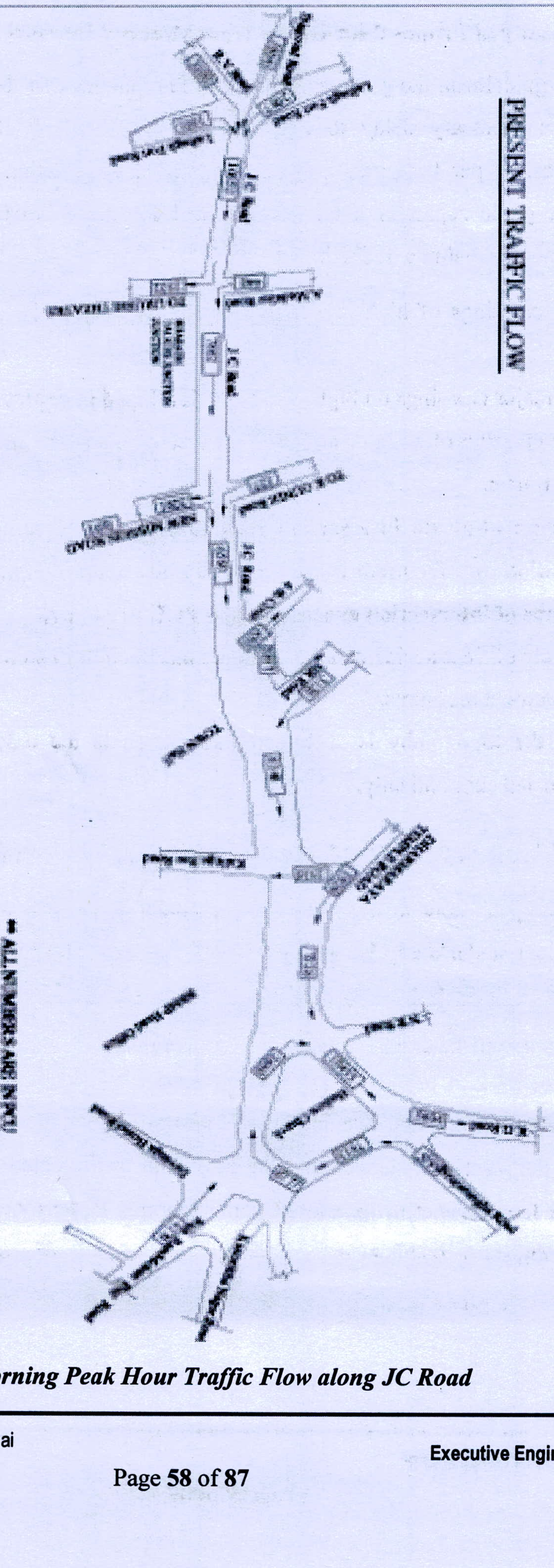


Figure 2-33: Overall Morning Peak Hour Traffic Flow along JC Road

2.3 Necessity of Proposal for Grade Separators at Intersections/Junctions

As per IRC guidelines, the grade separator shall be proposed at the intersection locations to avoid any unnecessary delay to the traffic passing through the junction. Under such circumstances, as per the guidelines of stipulated under Section 4.5 of IRC-92-2017, the necessity of grade separator shall be examined for the following conditions as guiding principle conceptualising a traffic interchange.

(a) At all crossings of highway of the major hierarchy to be developed as fully access controlled.

(b) At all major crossings on highways to be developed to expressway standards.

(c) At the crossing of a major arterial road with another road of similar category carrying heavy traffic.

(d) When an at-grade intersection fails to cater the volume of traffic resulting in congestion and frequent blockage at the intersection e.g., when total traffic of all the arms of intersection exceeds 10,000 PCU per hour.

(e) High rate of fatal accidents at an at-grade intersection in spite of other traffic control or improvement measures.

(f) When the topography is such that interchange is the only alternative that can be constructed economically.

2.3.1 Justification of Elevated Road from Minerva Junction to Hudson Circle

- As per the peak hour traffic summary presented above, it is clearly evident that all the intersections under study have crossed traffic volume of **10,000 PCU per Hour** during **Morning Peak period.**
- Similarly, comparing the **Evening Peak Hour** traffic at all the junctions also have crossed the limit of **10,000 PCU per Hour** except one junction which is also close to this value during **Evening Peak Period**.
- Since, all these junctions are located closely to each other within a span of **1.70 Km** length, it is suggested to propose an **Elevated Road right from Minerva Junction to Hudson Circle** to facilitate the movement of through traffic and providing relief to the local traffic, at grade level.

- In addition to this, by proposing through elevated road between Minerva Junction and Hudson Circle will also facilitate traffic in opposite direction from **Hudson Circle to Minerva Junction** which is presently using the Krubigal Road (Lalbagh Road).
- With the proposal of elevated road, traffic from south to north bangalore and North to south bangalore will be through, resulting in relief for the 7 at grade junctions
- The main component of total traffic which are in the form of 2 wheelerrs, 4 wheelers and Autos are expected to use the elevated road there by improving the condition for movement of public transport at grade.

2.4 Origin – Destination Survey Data Analysis

A sample survey of Origin –Destination study was carried out at Minerva Junction (R V Road and Sajjan Rao Circle Road) and Hudson Circle (on Nrupathunga Road and Raj Ram Mohan Roy Road) in order to assess the travel pattern of the vehicles such as Four Wheelers and Two Wheelers using the JC road and Lallbagh Road respectively. A broad list of zone was considered for the purpose of analyzing the travel pattern or characteristics of the vehicles trip. The list of zones considered for the analysis are listed below.

Table 2-36: List of O-D Zones

Zone No.	Zone Details
1	Jayanagar, Banashankari, Kanakapura Road, J.P. Nagar, B.T.M.Layout
2	Kumaraswamy Layout, Uttarahalli, N.R.Colony, Basavanagudi, Srinagar, Hanumanthanagar, Bank Coloney, V.V.Puram
3	Mysore Road, K. R.Market, Chord Road, Vijayanagar, Chandra Layout, Kengeri, Chamarajapet.
4	Mejastic, Yeshwanthpura, Gandhinagara, Rajajinagar, Mathikere, Mahalakshmi Layout.
5	Malleshwaram, Hebbala, Sadashivanagar, R.T.Nagar, Bangalore Inernational Airport
6	Shivajinagar, M.G.Road, Ulsoor, Indiranagar, K. R. Puram, Maraathhalli, Whitefield.
7	Hudson Circle, Cubbon Park, Corporation, Vidhanasoudha.
8	Sarjapur Road, Koramangala, Madiwala, Elelctronics City Hosur Road.
9	Double Road, Wilson Garden, Audugodi, Lakkasandra.

2.4.1 Sample Size of O-D Survey

No.	Location	Direction/Road	2-Wheeleers			4-Wheeleers		
			Total Traffic	No of Vehicles Interviewed	Sample Size	Total Traffic	No of Vehicles Interviewed	Sample Size
1	Minerva Junction	RV Road to Hudson Circle	7950	461	5.80%	3582	403	11.25%
2	Minerva Junction	Sajjan Rao Circle to Hudson Circle	10743	491	4.57%	3473	416	11.98%
3	Hudson Circle	Nrupathunga Road and RRM Road	19305	2005	10.39%	16377	1906	11.64%

2.4.2 O-D Data Analysis for RV Road and Sajjana Rao Circle Road (Diagonal Road) Traffic at Minerva Circle

- Origin-Destination sturdy was conducted by at Minerva Junction for the two arms i.e. RV Road and Sajjana Rao Circle.
- All the trips were categorized according to zones. O-D matrix has been developed based on the data collected.
- The collected data at Minerva Circle has been categorized based on each zone i.e. trip origin and their destination. The influence factors have been worked out to assess the potentiality of each zone in terms of trip generation and attraction. The influence factors for both Four Wheelers and Two Wheelers have been have been presented below.

Table 2-37: Influence Factors Based on O-D Survey at Minerva Circle

Zone No.	Influence Factors				Remarks
	R V Road		Sajjan Rao Circle Road		
	Four Wheelers	Two Wheelers	Four Wheelers	Two Wheelers	
1	34.49%	41.21%	15.26%	11.00%	Refer Note-1
2	15.51%	8.79%	33.17%	38.29%	
3	6.08%	6.40%	9.38%	12.22%	
4	5.46%	12.47%	6.61%	3.87%	Refer Note-2
5	8.06%	4.23%	15.38%	8.15%	
6	20.35%	16.05%	10.58%	12.02%	
7	4.71%	5.75%	6.49%	11.81%	
8	1.99%	1.52%	1.32%	0.61%	
9	3.35%	3.58%	1.80%	2.04%	
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	

Note-1: *Zone 1 and Zone 2 are the Trip Origin Zones Prior to Minerva Junction.*

Note-2: *Zone 4, Zone 5, Zone 6 and Zone 7 are the Destination zones. The trips originated from Zone 1 and Zone 2 are bound to these Destination zones. Influence Factor for these zones works out to be* ***39% for Four Wheelers and 37% for Two Wheelers***

- From the above table it is observed that the traffic originating out of Zone 1 and 2 will get distributed on to other seven zones.
- Out of the remaining seven zones, zone no 4, 5, 6 and 7 will account for the through traffic between Minerva Circle to Hudson Circle and beyond Hudson circle.
- Zone no 3, 8 and 9 will account for the leakage of traffic between Minerva Circle and Hudson circle.
- From the above table, it is evident that, the zones except 3, 8 and 9 will account for more than 45 to 50% of the trips as per the influence factors from the zones located prior to Minerva Junction i.e. Zone 1 and Zone 2.
- Similarly, the zones located after Hudson Circle contributing to through trips on JC road from Minerva Junction towards Hudson circle and beyond Hudson circle which includes Zone 4, Zone 5, Zone 6 and Zone 7 with overall influence factors of these zones will account 35 to 40%.
- ***Therefore, for the purpose of assessment of through traffic on elevated road, 40% of the trips of both from 2-Wheelrs and Four Whelers entering JC Road from RV Road and Sajjana Rao Circle Road have been accounted for the proposed Elevated Road.***

2.4.3 O-D Analysis for Nrupathunga Road and Raja Ram Mohan Roy (RRMR) Road at Hudson Circle

Further, O-D study was also conducted on two roads approaching the Hudson circle i.e. on Nrupathunga Road and Raj Ram Mohan Roy Road to assess the traffic pattern which may use the JC road if a provision is made to use the proposed elevated road in two-way directional traffic movement.

The O-D data has been analysed for the collected data at Hudson Circle on two roads as mentioned above. The influence factors for zones have been calculated at this location for the two types of vehicles.

Table 2-38: Influence Factors Based on O-D Survey at Hudson Circle

Zone No.	Influence Factors				Remarks
	Nrupathunga Road		Rajaram Mohan Roy (RRMR) Road		
	Four Wheelers	Two Wheelers	Four Wheelers	Two Wheelers	
1	9.00%	8.50%	2.39%	3.32%	Refer Note-3
2	1.97%	1.05%	0.58%	0.57%	
3	20.51%	19.93%	15.30%	14.97%	
4	37.17%	35.94%	32.89%	31.75%	Refer Note-4
5	7.37%	7.73%	2.49%	1.24%	
6	5.17%	6.98%	22.81%	27.79%	
7	5.27%	7.33%	1.51%	2.71%	
8	10.18%	8.80%	17.88%	11.16%	Refer Note-3
9	3.36%	3.74%	4.14%	6.49%	
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	

Note-3: *Zone 1, Zone 2, Zone 3, Zone 8 and Zone 9 are the Destination zones. The trips originated from Zone 4, Zone 5 and Zone 6 are bound to these destination zones. Influence Factor for these zones works out to be* ***43% for Four Wheelers and 40% for Two Wheelers.***

Note-4: *Zone 4, Zone 5, Zone 6 and Zone 7 are the Trip Origin Zones Prior to Hudson Circle.*

- From the above table it is observed that the traffic originating out of Zone 4, Zone 5, Zone 6 and Zone 7 will get distributed on to other seven zones.
- Out of the remaining five zones, Zone 1, Zone 2, Zone 3, Zone 8 and Zone 9 will account for the through traffic between Hudson Circle to Minerva Circle and beyond Minerva circle.
- Zone no 3, 8 and 9 will account for the leakage of traffic between Hudson circle to Minerva Circle.
- From the above table, it is evident that, the Zone 4, Zone 5, Zone 6 and Zone 7 will account for more than 55 to 60% of the trips as per the influence factors from the zones located prior to Hudson Circle i.e. Zone 4, Zone 5, Zone 6 and Zone 7.
- Similarly, the zones located after Minerva Junction contributing to through trips on JC road from Hudson Circle to Minerva Junction and beyond Minerva Junction which includes Zone 1, Zone 2, Zone 3, Zone 8 and Zone 9 with overall influence factors of these zones will account 40 to 45%.

- ***Therefore, for the purpose of assessment of through traffic on elevated road, 45% of the trips of both 2-Wheelrs and Four Whelers entering JC Road at Hudson Circle from Nrupathunga road as well as RRMR road have been accounted for the proposed Elevated Road in the opposite direction from Hudson Circle to Minerva Junction.***

2.5 Present Traffic on JC Road and Krumbigal Road (Lalbagh Road)

2.5.1 Present Traffic on JC Road from Minerva Junction to Hudson Circle

From the analysis, the traffic i.e. using JC road between Minerva Junction, Town Hall Junction and Hudson Circle is presented below. The traffic on the proposed road corridor is based on the maximum of the Peak hour traffic. It is observed that at almost all locations the maximum peak occurs in the morning peak period. Therefore, for the purpose of estimating the traffic for the corridor the morning peak hour traffic has been considered.

Table 2-39: Traffic on JC Road (From Minerva Junction to Hudson Circle)

Vehicles/Locations	**Between Minerva Junction and AM Rd & Urvashi Theatre Road Junction**	**Between Urvashi Theatre Road Junction and Shivaji Theatre Junction before Town Hall Junction**	**Between Shivaji Theatre Junction and Town Hall Junction**	**Between Town Hall Junction & Badami House (SP Rd & Mission Rd) Junction**	**Between Badami House (SP Rd & Mission Rd) Junction & Halsur Gate Police Station Junction[#]**	**Between Halsur Gate Police Station Junction to KG Road & Kasturba Road Junction[$]**
2 Wheelers	6325	4820	3431	2256	3276	5011
Auto Rickshaw	1634	1196	926	846	990	1487
Car/Jeep/Van	1947	1404	1396	1349	1888	2316
Min-Bus	21	11	24	74	70	78
Std. Bus	212	96	197	310	281	388
LCV	96	92	135	49	48	188
2 Axle Trucks	23	22	33	44	54	43
3 Axle Trucks	2	11	4	0	0	20
MAVs	0	0	2	0	0	0
Tractor With Trailer	1	1	1	0	0	0
Tractor Without Trailer	0	0	0	0	0	0
Cycle	4	2	12	0	3	11
Bullock Cart	0	0	0	0	0	0
Horse Drawn Vehicle	0	0	0	0	0	0

Vehicles/Locations	Between Minerva Junction and AM Rd & Urvashi Theatre Road Junction	Between Urvashi Theatre Road Junction and Shivaji Theatre Junction before Town Hall Junction	Between Shivaji Theatre Junction and Town Hall Junction	Between Town Hall Junction & Badami House (SP Rd & Mission Rd) Junction	Between Badami House (SP Rd & Mission Rd) Junction & Halsur Gate Police Station Junction[#]	Between Halsur Gate Police Station Junction to KG Road & Kasturba Road Junction[$]
Hand Drawn Vehicle	0	0	0	0	0	0
Total Vehicles	**10265**	**7654**	**6160**	**4928**	**6610**	**9543**
Total PCU	**10652**	**7862**	**6581**	**6149**	**7228**	**10455**

[#] The traffic in this section includes the traffic coming from KR Market via Sharada Theatre and Traffic Coming from JC Road from Town Hall Junction to Hudson Circle.

[$] The traffic in this section includes the traffic coming from KR Market via Sharada Theatre and Traffic Coming from JC Road from Town Hall Junction to Hudson Circle along with traffic from Rajaram Mohan Roy Road.

The vehicular compositions of traffic between the above locations are given in the Table below.

Table 2-40: Traffic Composition on JC Road form Minerva Circle to Hudson Circle

Vehicles/Locations	Between Minerva Junction and AM Rd & Urvashi Theatre Road Junction	Between Urvashi Theatre Road Junction and Shivaji Theatre Junction before Town Hall Junction	Between Shivaji Theatre Junction and Town Hall Junction	Between Town Hall Junction & Badami House (SP Rd & Mission Rd) Junction	Between Badami House (SP Rd & Mission Rd) Junction & Halsur Gate Police Station Junction	Between Halsur Gate Police Station Junction to KG Road & Kasturba Road Junction
2 Wheelers	61.6%	63.0%	55.7%	45.8%	49.6%	52.5%
Auto Rickshaw	15.9%	15.6%	15.0%	17.2%	15.0%	15.6%
Car/Jeep/Van	19.0%	18.3%	22.7%	27.4%	28.6%	24.3%
Min-Bus	0.2%	0.1%	0.4%	1.5%	1.1%	0.8%
Std. Bus	2.1%	1.3%	3.2%	6.3%	4.3%	4.1%
LCV	0.9%	1.2%	2.2%	1.0%	0.7%	2.0%
2 Axle Trucks	0.2%	0.3%	0.5%	0.9%	0.8%	0.5%
3 Axle Trucks	0.0%	0.1%	0.1%	0.0%	0.0%	0.2%
MAVs	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tractor With Trailer	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tractor Without Trailer	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Vehicles/Locations	Between Minerva Junction and AM Rd & Urvashi Theatre Road Junction	Between Urvashi Theatre Road Junction and Shivaji Theatre Junction before Town Hall Junction	Between Shivaji Theatre Junction and Town Hall Junction	Between Town Hall Junction & Badami House (SP Rd & Mission Rd) Junction	Between Badami House (SP Rd & Mission Rd) Junction & Halsur Gate Police Station Junction	Between Halsur Gate Police Station Junction to KG Road & Kasturba Road Junction
Cycle	0.0%	0.0%	0.2%	0.0%	0.0%	0.1%
Bullock Cart	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Horse Drawn Vehicle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hand Drawn Vehicle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total Vehicles	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The above table indicates that at all the sections of road, the two wheelers are the major contributors to the total traffic. Next forms the four wheelers traffic and the auto/three wheelers. All other traffic constitutes less than 6% of the total traffic. In order to assess the through traffic on the road between Minerva Junction and Hudson Circle traffic flow characteristics in terms of their directional movement is absolutely necessary which is done based on O-D Survey data analysis.

After reaching the Ulsoor Gate Police Station, the traffic gets bifurcated towards Kempegowda Road (towards Majestic) and Kasturba/Cubbon Park Roads at Hudson Circle. The details of the traffic on these two direction is presented below.

Table 2-41: Traffic Movement towards KG Road and Kasturba Road after Halasur Gate Police Station Junction

Vehicles	Halsur Gate Police Station Junction to KG Road	Halasur Gate Police Station Junction to Kasturba Road
2 Wheelers	2360	2650
Auto Rickshaw	937	550
Car/Jeep/Van	1278	1038
Min-Bus	48	30
Std. Bus	187	201
LCV	99	89
2 Axle Trucks	24	20

Vehicles	Halsur Gate Police Station Junction to KG Road	Halasur Gate Police Station Junction to Kasturba Road
3 Axle Trucks	2	18
MAVs	0	0
Tractor With Trailer	0	0
Tractor Without Trailer	0	0
Cycle	6	5
Bullock Cart	0	0
Horse Drawn Vehicle	0	0
Hand Drawn Vehicle	0	0
Total Vehicles	**4942**	**4601**
Total PCU	**5604**	**4851**

2.5.2 Present Traffic Leading to Krumbigal Road (Lalbagh Road) from Hudson Circle

- The traffic leading to Lalbagh road (Krumbigal Road) from Nrupathunga Road and Rajaram Mohan Roy Road has been considered in order to assess the likely traffic that may use the proposed Elevated Road from Minerva Junction to Hudson Circle in the opposite direction i.e. from Hudson Circle to Minerva Junction.
- The elevated road is facilitating the two-way traffic at Hudson Circle enabling the traffic from Nrupathunga Road and Raja Ram Mohan Roy (RRMR) Road at Hudson Circle.
- The present traffic leading to Lalbagh road (Krumbigal Road) from Hudson Circle has been summarised based on the survey and presented in table below.
- This traffic volume will be factored based on the influence factor calculated based on the O-D survey data analysis and will arrive at the volume of traffic going to use the proposed elevated road from Hudson Circle to Minerva Junction in the subsequent section below.

Table 2-42: Traffic Movement from Nrupathunga Road towards Devanga Hostel Road (to link with Mission Road) and From Nrupathunga Road to Mission Road at Badami House Junction

Vehicles/Locations	From Nrupathunga Road towards Devanga Hostel Road (To Link with Mission Road) at Hudson Circle	From Nrupathunga Road towards Mission Road at Badami House Junction
2 Wheelers	2119	237
Auto Rickshaw	777	105
Car/Jeep/Van	713	150
Min-Bus	10	1
Std. Bus	17	115
LCV	26	8
2 Axle Trucks	13	1
3 Axle Trucks	2	0
MAVs	0	0
Tractor With Trailer	0	0
Tractor Without Trailer	0	0
Cycle	1	0
Bullock Cart	0	0
Horse Drawn Vehicle	0	0
Hand Drawn Vehicle	0	0
Total Vehicles	**3678**	**617**
Total PCU	**4008**	**807**

2.6 Estimated Traffic on Elevated Road Between Minerva Junction and Hudson Circle

2.6.1 Estimated Traffic on Elevated Road from Minerva Junction to Hudson Circle Direction

- The traffic at Minerva Junction from RV Road and Sajjan Rao Circle have been proposed to use the proposed elevated road from Minerva Junction to Hudson Circle.
- Therefore, the traffic from these two roads have been factored with percentage of through traffic based on the O-D analysis carried out for the present work and same is presented below.

- As per detail furnished above, the through traffic from these two roads for 2-wheelers and four wheelers has been estimated as **40% of the total traffic entering JC road from these two said roads as per the Influence Factors.** The same percentage has been considered for Auto/Three Wheelers also.
- However, for all other vehicles i.e. for Mini-Bus, Buses and all Goods Vehicles, it is presumed that around 20% of the corresponding category of vehicles may use the proposed elevated road. The following table indicates the expected ***traffic on Elevated Road from Minerva Junction to Hudson Circle Direction***.

Table 2-43: Estimated Traffic on Proposed Elevated Road from Minerva Junction to Hudson Circle Direction

Vehicles/Locations	**Existing Traffic from RV Road**	**Existing Traffic from Sajjana Rao Circle**	**Total Traffic**	**Percentage of Through Traffic**	**Proposed Traffic on Elevated Road**	**Balance At-Grade Traffic from RV Road and Sajjan Rao Circle Road**
2 Wheelers	1738	2862	**4600**	40%	1840	2760
Auto Rickshaw	502	480	**982**	20%	393	589
Car/Jeep/Van	706	684	**1390**	40%	556	834
Min-Bus	6	4	**10**	20%	2	8
Std. Bus	15	9	**24**	20%	5	19
LCV	18	24	**42**	20%	8	33
2 Axle Trucks	8	5	**13**	20%	3	10
3 Axle Trucks	1	0	**1**	20%	0	1
MAVs	0	0	**0**	20%	0	0
Tractor With Trailer	0	1	**1**	20%	0	1
Tractor Without Trailer	0	0	**0**	20%	0	0
Cycle	1	2	**3**		0	3
Bullock Cart	0	0	**0**		0	0
Horse Drawn Vehicle	0	0	**0**		0	0
Hand Drawn Vehicle	0	0	**0**		0	0
Total Vehicles	**2994**	**4070**	**7064**		**2807**	**4258**
Total PCU	**3100**	**3864**	**6964**		**2753**	**4211**

From the above table it is clear that, the number of lanes required along Minerva Junction to Hudson Circle is 2 Lanes as on date considering LOS - C. for the present traffic considering the capacity as per IRC:92-2017

2.6.2 Estimated Traffic on Elevated Road from Hudson Circle to Minerva Junction Direction

- In addition to providing facility for the traffic from Minerva Junction to Hudson Circle, the traffic currently using Krumbigal Road (Lalbagh Road) to reach the Bangalore south areas beyond Minerva Junction through Devanga Hostel Road and Mission Road will be diverted to use the proposed elevated road from Minerva Junction to Hudson Circle in the opposite direction.
- By facilitating traffic movement on elevated road from Hudosn Circle to Minerva Junction, it would provide relief to the traffic on Krumbigal Road (Lalbagh Road).
- The traffic from Nrupathunga Road towards Devanga Hostel Road (to link with Mission Road) and from Raja Ram Mohan Roy Road /Nrupathunga Road to Mission Road at Badami House Junction have been factored with percentage of through traffic based on the O-D analysis and presented below.
- As per details furnished above, the through traffic from these two roads i.e. Nrupathunga Road and Raja Ram Mohan Roy Roads, the through traffic pertaining to 2-wheelers and four wheelers has been estimated as **45% of the total traffic entering Krumbigal Road via Devanga Hostel Road and Mission Road as per the Influence Factors**. The same percentage has been considered for Auto/Three Wheelers also.
- However, for all other vehicles i.e. for Mini-Bus, Buses and all Goods Vehicles, it is presumed that around 20% of the corresponding category of vehicles may use the proposed elevated road. The following table indicates the expected ***traffic on Elevated Road from Hudson Circle to Minerva Junction***.

Table 2-44: Estimated Traffic on Proposed Elevated Road from Hudson Circle to Minerva Junction

Vehicles/ Locations	From Nrupathunga Road towards Devanga Hostel Road (To Link with Mission Road) at Hudson Circle	From Nrupathunga Road towards Mission Road at Badami House Junction	Total Traffic to Krumbigal Road	% of Through Traffic	Proposed Traffic on Elevated Road - Hudson Circle to Minerva Junction	Balance At-Grade Traffic on Krumbigal Road (Lalbagh Road) from Hudson Circle
2 Wheelers	2119	237	**2356**	45%	1060	1296
Auto Rickshaw	777	105	**882**	15%	132	749
Car/Jeep/Van	713	150	**863**	45%	388	474
Min-Bus	10	1	**11**	20%	2	9
Std. Bus	17	115	**132**	20%	26	106
LCV	26	8	**34**	20%	7	27
2 Axle Trucks	13	1	**15**	20%	3	12
3 Axle Trucks	2	0	**2**	20%	0	2
MAVs	0	0	**0**	20%	0	0
Tractor With Trailer	0	0	**0**	20%	0	0
Tractor Without Trailer	0	0	**0**	20%	0	0
Cycle	1	0	**1**		0	1
Bullock Cart	0	0	**0**		0	0
Horse Drawn Vehicle	0	0	**0**		0	0
Hand Drawn Vehicle	0	0	**0**		0	0
Total Vehicles	**3678**	**617**	**4295**		**1619**	**2676**
Total PCU	**4008**	**807**	**4814**		**1527**	**3287**

From the above table it is clear that, the number of lanes required along Hudson Circle to Minerva Junction is 2 Lanes as on date.

2.7 Traffic Projections

Generally, the facilities planned for facilitating of smooth flow of traffic both in urban and rural areas will be planned not only for present but also for future time horizon. In order to plan such facility, it is required to project the current traffic to certain time period say for about 20 years or 30 years.

For the purpose of traffic projections, following details have been considered for assessing the future traffic growth rates.

(a) Growth Rates based on Vehicle Registration Data for Bengaluru Metropolitan Area for last 8 Years.

(b) Growth Rates based on Econometric Method.

2.7.1 Growth Rates based on Vehicle Registration Data for Bengaluru Metropolitan Area

- The data published by Transport Department, GoK in their Website has been compiled to estimate the growth of registered vehicles in Bangalore Metropolitan area.
- For the purpose of assessing the future traffic growth rates, the vehicles **(2 Wheelers and Four Wheelers)** registered in Bangalore Metropolitan area have been analysed from 2015 to 2022.
- In addition to these two vehicle types, the growth of registered all vehicles has also been analysed.

Table 2-45: Registered Vehicles Growth in Bangalore Metropolitan Area (2015-2022)

SL. NO.	YEAR	TWO WHEELERS	4-WHEELERS	AUTO-RICKSHAWS	BUSES	LCVS	HCVS	ALL VEHICLES
1	31.03.2015	3841139	1088587	149944	37689	102797	92414	5559730
2	31.03.2016	4222676	1191541	162932	40570	113322	98127	6112897
3	31.03.2017	4731159	1321815	173584	43066	123277	105557	6833080
4	31.03.2018	5134055	1432374	185344	46587	134155	112717	7406202
5	31.03.2019	5588029	1541017	202033	49308	148863	121618	8049891
6	31.03.2020	6418232	1989509	289391	116877	227422	186185	9638362
7	31.03.2021	6673856	2085384	290650	117263	235223	188818	10010588
8	31.03.2022	6931839	2197158	292128	118285	245652	193753	10409289
	Average Growth, %	**11.49%**	**14.55%**	**13.55%**	**30.55%**	**19.85%**	**15.67%**	**12.46%**

- ***From the above, it is clear that the general traffic growth of all vehicles is about 12.46% for the last 8 years from 2015 to 2022.***
- ***This indicates that, the traffic has also increased at the same rate and will continue to grow at the same rate more or less.***
- ***In the event, if the present traffic expected on elevated road as well as on the at grade level on JC road are projected with above growth rate, then the requirement of lanes will be very high.***

2.7.2 Growth Rates based on Econometric Method

In this method, the growth in NSDP and Per-Capita NSDP for the Karnataka State has been referred and correlated with the vehicle registration data presented above. The growth of NSDP and Per-Capita Income of the state is 7.77% and 6.92% respectively for last 8 years. Details of the Karnataka State Economic growth is presented in table below.

Table 2-46: Growth of NSDP and Per-Capita Income for Karnataka State

Year	AT CONSTANT PRICE (2011-12)			
	NSDP In Rs. Crores	**Growth of NSDP per Year, %**	**NSDP-Per-Capita Income in Rs.**	**Growth of NSDP Per-Capita Income per Year, %**
2014-15	6,71,283		1,05,697	
2015-16	7,49,952	11.72%	1,16,813	10.52%
2016-17	8,51,394	13.53%	1,31,186	12.30%
2017-18	9,18,796	7.92%	1,41,229	7.66%
2018-19	9,75,111	6.13%	1,48,690	5.28%
2019-20	10,23,690	4.98%	1,54,861	4.15%
2020-21	10,26,875	0.31%	1,54,123	-0.48%
2021-22	11,27,480	9.80%	1,68,050	9.04%
Average Growth, %		**7.77%**		**6.92%**

As per the Econometric Method, the demand Elasticity "E" Value need to be calculated as per IRC 108 guidelines. Therefore, the vehicle registration data of Karnataka State and state income in terms of NSDP growth have been considered in the regression analysis to obtain the demand Elasticity "E" Value. Based on the regression analysis, the following are the demand Elasticity "E" Value are presented for different vehicle types.

Table 2-47: Estimated Elasticity "E" Value based on NSDP for Karnataka State and Bangalore Vehicle Registration

VEHICLE TYPES	**TWO WHEELERS**	**4-WHEELERS**	**AUTO-RICKSHAWS**	**BUSES**	**LCVS**	**HCVS**	**ALL VEHICLES**
Demand Elasticity "E" Value as per NSDP	1.222	1.444	1.442	2.481	1.833	1.589	1.300

Therefore, the combined growth rate is arrived by multiplying the average NSDP growth rate of Karnataka State and Demand Elasticity "E" Value of corresponding vehicle type to arrive at the individual vehicle growth rate. Details of the same are presented below.

Table 2-48: Estimated Combined Growth Rate as per Econometric Method

VEHICLE TYPES	TWO WHEELERS	4-WHEELERS	AUTO-RICKSHAWS	BUSES	LCVS	HCVS	ALL VEHICLES
Demand Elasticity "E" Value as per NSDP	9.49%	11.22%	11.20%	19.27%	14.24%	12.35%	10.10%

2.7.3 Sensitivity of Traffic Growth Rates

The effect of various factors, which influence the traffic growth rates are generally the economic growth of region or a state. This is dependent mainly based on the Agriculture and industrial development plans for the study under consideration. Since the present study is mainly limited to major urban area, traffic growth may vary based on the various policy related to industrial sector development. Therefore, the sensitivity in growth rate has been arrived keeping the growth rate assessed by Econometric Method as Most Likely Scenario of traffic growth rate. The pessimistic and optimistic scenarios have been worked out by varying the growth rates derived by econometric method by decreasing and increasing the estimated growth rates by 25%.

Table 2-49: Sensitivity Analysis of Traffic Growth Rates

No.	Growth Rate Scenario	Traffic Growth Rate	Remarks
1	Most Likely Scenario Traffic Growth Rate	10.10%	As per Econometric Method
2	Pessimistic Scenario Traffic Growth Rate	7.58%	Reduction of Growth Rate by 25% as estimated in Econometric Method
3	Optimistic Scenario Traffic Growth Rate	12.63%	Increase of Growth Rate by 25% as estimated in Econometric Method

Based on the above estimated traffic growth rates, the traffic projections have been carried out for both at grade and elevated road along JC road as well as traffic towards Lalbagh road from Hudson Circle and presented in the following tables considering the Most Likely Traffic Growth scenario.

Table 2-50: Projected At Grade Traffic (Without Elevated Road) along JC Road from Minerva Junction to Hudson Circle

YEAR	Motorised Vehicles											Non-Motorised Vehicles				Total Vehicles	Total PCUs
	Two Wheelers	Auto Rickshaw	Car/Jeep/Van/Taxi	Mini Bus	Standard Bus	LCV	2-Axle Trucks	3-Axle Trucks	Multi Axle Trucks	Tractor with Trailer	Tractor without Trailer	Cycles	Bullock Carts	Horse Carts	Hand Drawn Vehicles		
2022	4600	982	1390	10	24	42	13	1	0	1	0	3	0	0	0	**7064**	**6964**
2023	5037	1092	1546	11	28	48	14	1	0	1	0	3	0	0	0	**7780**	**7691**
2024	5515	1215	1719	12	34	54	16	1	0	1	0	3	0	0	0	**8570**	**8496**
2025	6038	1351	1912	13	40	62	18	1	0	1	0	4	0	0	0	**9440**	**9386**
2026	6612	1502	2126	15	48	71	20	1	0	1	0	4	0	0	0	**10400**	**10370**
2027	7239	1671	2364	16	57	81	23	1	0	2	0	4	0	0	0	**11458**	**11459**
2028	7926	1858	2629	18	68	93	25	1	0	2	0	5	0	0	0	**12625**	**12664**
2029	8679	2067	2923	20	81	106	29	1	0	2	0	5	0	0	0	**13913**	**13998**
2030	9503	2298	3251	22	97	121	32	1	0	2	0	6	0	0	0	**15333**	**15475**
2031	10405	2556	3615	24	116	138	36	2	0	2	0	6	0	0	0	**16900**	**17110**
2032	11392	2843	4020	26	138	158	41	2	0	3	0	7	0	0	0	**18629**	**18921**
2033	12474	3162	4471	29	164	180	46	2	0	3	0	8	0	0	0	**20538**	**20926**
2034	13658	3516	4972	32	196	206	51	2	0	3	0	8	0	0	0	**22645**	**23149**
2035	14955	3911	5529	35	234	235	58	2	0	3	0	9	0	0	0	**24971**	**25612**
2036	16374	4349	6148	38	279	269	65	3	0	4	0	10	0	0	0	**27539**	**28343**
2037	17929	4837	6837	42	333	307	73	3	0	4	0	11	0	0	0	**30376**	**31371**
2038	19630	5379	7603	47	397	350	82	3	0	5	0	12	0	0	0	**33509**	**34730**
2039	21494	5983	8455	51	473	400	92	3	0	5	0	14	0	0	0	**36971**	**38457**
2040	23534	6654	9403	57	565	457	103	4	0	6	0	15	0	0	0	**40797**	**42593**
2041	25768	7400	10456	62	674	523	116	4	0	6	0	17	0	0	0	**45026**	**47186**
2042	28215	8230	11628	69	803	597	130	5	0	7	0	18	0	0	0	**49701**	**52286**
2043	30893	9153	12931	75	958	682	146	5	0	8	0	20	0	0	0	**54871**	**57954**
2044	33826	10179	14379	83	1143	779	164	6	0	8	0	22	0	0	0	**60589**	**64254**
2045	37037	11321	15991	91	1363	890	184	6	0	9	0	24	0	0	0	**66917**	**71259**
2046	40552	12591	17782	101	1626	1017	207	7	0	10	0	27	0	0	0	**73919**	**79052**
2047	44402	14003	19775	111	1939	1161	233	7	0	11	0	30	0	0	0	**81672**	**87727**

YEAR	Motorised Vehicles											Non-Motorised Vehicles				Total Vehicles	Total PCUs
	Two Wheelers	Auto Rickshaw	Car/Jeep/Van/Taxi	Mini Bus	Standard Bus	LCV	2-Axle Trucks	3-Axle Trucks	Multi Axle Trucks	Tractor with Trailer	Tractor without Trailer	Cycles	Bullock Carts	Horse Carts	Hand Drawn Vehicles		
2048	48617	15573	21991	122	2313	1327	261	8	0	12	0	33	0	0	0	**90257**	**97386**
2049	53232	17320	24455	134	2758	1515	294	9	0	13	0	36	0	0	0	**99767**	**108147**
2050	58285	19262	27195	148	3290	1731	330	10	0	15	0	39	0	0	0	**110306**	**120143**
2051	63818	21423	30242	163	3924	1978	371	11	0	16	0	43	0	0	0	**121989**	**133522**

Table 2-51: Projected Traffic Volume for On Elevated Road Traffic Along JC Road - Minerva Junction to Hudson Circle

YEAR	Motorised Vehicles											Non-Motorised Vehicles				Total Vehicles	Total PCUs
	Two Wheelers	Auto Rickshaw	Car/Jeep/Van/Taxi	Mini Bus	Standard Bus	LCV	2-Axle Trucks	3-Axle Trucks	Multi Axle Trucks	Tractor with Trailer	Tractor without Trailer	Cycles	Bullock Carts	Horse Carts	Hand Drawn Vehicles		
2022	1840	393	556	2	5	8	3	0	0	0	0	0	0	0	0	**2807**	**2753**
2023	2015	437	618	2	6	10	3	0	0	0	0	0	0	0	0	**3090**	**3040**
2024	2206	486	688	2	7	11	3	0	0	0	0	0	0	0	0	**3403**	**3356**
2025	2415	540	765	3	8	12	4	0	0	0	0	0	0	0	0	**3747**	**3705**
2026	2645	601	850	3	10	14	4	0	0	0	0	0	0	0	0	**4127**	**4092**
2027	2896	668	946	3	11	16	5	0	0	0	0	0	0	0	0	**4546**	**4518**
2028	3171	743	1052	4	14	19	5	0	0	0	0	0	0	0	0	**5007**	**4990**
2029	3472	827	1169	4	16	21	6	0	0	0	0	0	0	0	0	**5515**	**5512**
2030	3801	919	1300	4	19	24	6	0	0	0	0	0	0	0	0	**6076**	**6089**
2031	4162	1022	1446	5	23	28	7	0	0	0	0	0	0	0	0	**6694**	**6728**
2032	4557	1137	1608	5	28	32	8	0	0	1	0	0	0	0	0	**7376**	**7434**
2033	4990	1265	1788	6	33	36	9	0	0	1	0	0	0	0	0	**8127**	**8215**
2034	5463	1407	1989	6	39	41	10	0	0	1	0	0	0	0	0	**8956**	**9079**
2035	5982	1564	2212	7	47	47	12	0	0	1	0	0	0	0	0	**9871**	**10035**
2036	6550	1740	2459	8	56	54	13	1	0	1	0	0	0	0	0	**10880**	**11093**
2037	7171	1935	2735	8	67	61	15	1	0	1	0	0	0	0	0	**11993**	**12265**

YEAR	Motorised Vehicles											Non-Motorised Vehicles				Total Vehicles	Total PCUs
	Two Wheelers	Auto Rickshaw	Car/Jeep/Van/Taxi	Mini Bus	Standard Bus	LCV	2-Axle Trucks	3-Axle Trucks	Multi Axle Trucks	Tractor with Trailer	Tractor without Trailer	Cycles	Bullock Carts	Horse Carts	Hand Drawn Vehicles		
2038	7852	2152	3041	9	79	70	16	1	0	1	0	0	0	0	0	**13222**	**13562**
2039	8598	2393	3382	10	95	80	18	1	0	1	0	0	0	0	0	**14578**	**14998**
2040	9414	2662	3761	11	113	91	21	1	0	1	0	0	0	0	0	**16074**	**16590**
2041	10307	2960	4182	12	135	105	23	1	0	1	0	0	0	0	0	**17727**	**18352**
2042	11286	3292	4651	14	161	119	26	1	0	1	0	0	0	0	0	**19551**	**20306**
2043	12357	3661	5172	15	192	136	29	1	0	2	0	0	0	0	0	**21565**	**22470**
2044	13530	4072	5752	17	229	156	33	1	0	2	0	0	0	0	0	**23790**	**24871**
2045	14815	4528	6396	18	273	178	37	1	0	2	0	0	0	0	0	**26248**	**27532**
2046	16221	5036	7113	20	325	203	41	1	0	2	0	0	0	0	0	**28964**	**30484**
2047	17761	5601	7910	22	388	232	47	1	0	2	0	0	0	0	0	**31964**	**33759**
2048	19447	6229	8796	24	463	265	52	2	0	2	0	0	0	0	0	**35281**	**37395**
2049	21293	6928	9782	27	552	303	59	2	0	3	0	0	0	0	0	**38948**	**41430**
2050	23314	7705	10878	30	658	346	66	2	0	3	0	0	0	0	0	**43002**	**45912**
2051	25527	8569	12097	33	785	396	74	2	0	3	0	0	0	0	0	**47486**	**50891**

Table 2-52: Projected Traffic Volume for At Grade Traffic - Total Traffic Towards Lalbagh Road

YEAR	Motorised Vehicles											Non-Motorised Vehicles				Total Vehicles	Total PCUs
	Two Wheelers	Auto Rickshaw	Car/Jeep/Van/Taxi	Mini Bus	Standard Bus	LCV	2-Axle Trucks	3-Axle Trucks	Multi Axle Trucks	Tractor with Trailer	Tractor without Trailer	Cycles	Bullock Carts	Horse Carts	Hand Drawn Vehicles		
2022	2356	882	863	11	132	34	15	2	0	0	0	1	0	0	0	**4295**	**4789**
2023	2579	981	959	12	158	39	16	2	0	0	0	1	0	0	0	**4748**	**5320**
2024	2824	1091	1067	13	188	44	19	2	0	0	0	2	0	0	0	**5250**	**5913**
2025	3092	1213	1186	14	225	51	21	3	0	0	0	2	0	0	0	**5807**	**6575**
2026	3386	1349	1319	16	268	58	23	3	0	0	0	2	0	0	0	**6424**	**7314**

YEAR	Motorised Vehicles											Non-Motorised Vehicles				Total Vehicles	Total PCUs
	Two Wheelers	Auto Rickshaw	Car/Jeep/ Van/Taxi	Mini Bus	Standard Bus	LCV	2-Axle Trucks	3-Axle Trucks	Multi Axle Trucks	Tractor with Trailer	Tractor without Trailer	Cycles	Bullock Carts	Horse Carts	Hand Drawn Vehicles		
2027	3707	1500	1467	17	319	66	26	3	0	1	0	2	0	0	0	**7109**	**8141**
2028	4059	1668	1632	19	381	76	29	4	0	1	0	2	0	0	0	**7871**	**9066**
2029	4444	1855	1814	21	454	86	33	4	0	1	0	3	0	0	0	**8716**	**10101**
2030	4866	2064	2018	23	542	99	37	4	0	1	0	3	0	0	0	**9656**	**11260**
2031	5328	2295	2244	25	646	113	42	5	0	1	0	3	0	0	0	**10702**	**12561**
2032	5834	2552	2495	28	771	129	47	5	0	1	0	3	0	0	0	**11866**	**14020**
2033	6388	2839	2775	31	920	147	53	6	0	1	0	4	0	0	0	**13162**	**15659**
2034	6994	3157	3086	34	1097	168	59	6	0	1	0	4	0	0	0	**14606**	**17502**
2035	7658	3511	3431	37	1308	192	67	7	0	1	0	5	0	0	0	**16217**	**19577**
2036	8385	3905	3816	41	1560	219	75	8	0	1	0	5	0	0	0	**18015**	**21914**
2037	9181	4343	4243	45	1861	250	84	8	0	1	0	6	0	0	0	**20023**	**24549**
2038	10053	4830	4719	50	2220	286	94	9	0	2	0	6	0	0	0	**22268**	**27525**
2039	11007	5372	5247	55	2647	327	106	10	0	2	0	7	0	0	0	**24780**	**30888**
2040	12052	5974	5835	60	3157	373	119	11	0	2	0	8	0	0	0	**27592**	**34694**
2041	13196	6644	6489	66	3766	426	134	12	0	2	0	8	0	0	0	**30745**	**39005**
2042	14449	7389	7216	73	4492	487	151	14	0	2	0	9	0	0	0	**34282**	**43896**
2043	15820	8218	8025	80	5357	556	169	15	0	3	0	10	0	0	0	**38254**	**49450**
2044	17322	9139	8924	89	6390	636	190	17	0	3	0	11	0	0	0	**42720**	**55766**
2045	18967	10164	9924	98	7621	726	213	18	0	3	0	12	0	0	0	**47747**	**62958**
2046	20767	11304	11036	107	9090	829	240	20	0	3	0	13	0	0	0	**53411**	**71157**
2047	22738	12572	12273	118	10842	948	269	22	0	4	0	15	0	0	0	**59801**	**80517**
2048	24897	13982	13648	130	12931	1082	303	24	0	4	0	16	0	0	0	**67018**	**91218**
2049	27260	15550	15177	143	15423	1237	340	27	0	4	0	18	0	0	0	**75180**	**103467**
2050	29848	17294	16878	158	18395	1413	382	30	0	5	0	20	0	0	0	**84422**	**117508**
2051	32682	19234	18769	174	21941	1614	429	33	0	5	0	22	0	0	0	**94901**	**133625**

Table 2-53: Projected Traffic Volume for On Elevated Road Traffic Along JC Road - Hudson Circle to Minerva Junction

YEAR	Motorised Vehicles											Non-Motorised Vehicles				Total Vehicles	Total PCUs
	Two Wheelers	Auto Rickshaw	Car/Jeep/ Van/Taxi	Mini Bus	Standard Bus	LCV	2-Axle Trucks	3-Axle Trucks	Multi Axle Trucks	Tractor with Trailer	Tractor without Trailer	Cycles	Bullock Carts	Horse Carts	Hand Drawn Vehicles		
2022	1060	132	388	2	26	7	3	0	0	0	0	0	0	0	0	**1619**	**1527**
2023	1161	147	432	2	32	8	3	0	0	0	0	0	0	0	0	**1785**	**1689**
2024	1271	164	480	3	38	9	4	0	0	0	0	0	0	0	0	**1968**	**1870**
2025	1392	182	534	3	45	10	4	1	0	0	0	0	0	0	0	**2170**	**2070**
2026	1524	202	594	3	54	12	5	1	0	0	0	0	0	0	0	**2393**	**2292**
2027	1668	225	660	3	64	13	5	1	0	0	0	0	0	0	0	**2640**	**2540**
2028	1827	250	734	4	76	15	6	1	0	0	0	0	0	0	0	**2913**	**2815**
2029	2000	278	816	4	91	17	7	1	0	0	0	0	0	0	0	**3215**	**3121**
2030	2190	310	908	5	108	20	7	1	0	0	0	0	0	0	0	**3548**	**3462**
2031	2398	344	1010	5	129	23	8	1	0	0	0	0	0	0	0	**3918**	**3842**
2032	2625	383	1123	6	154	26	9	1	0	0	0	0	0	0	0	**4327**	**4266**
2033	2875	426	1249	6	184	29	11	1	0	0	0	0	0	0	0	**4780**	**4739**
2034	3147	474	1388	7	219	34	12	1	0	0	0	0	0	0	0	**5283**	**5267**
2035	3446	527	1544	7	262	38	13	1	0	0	0	0	0	0	0	**5839**	**5858**
2036	3773	586	1717	8	312	44	15	2	0	0	0	0	0	0	0	**6457**	**6518**
2037	4132	651	1909	9	372	50	17	2	0	0	0	0	0	0	0	**7143**	**7257**
2038	4524	724	2123	10	444	57	19	2	0	0	0	0	0	0	0	**7904**	**8086**
2039	4953	806	2361	11	529	65	21	2	0	0	0	0	0	0	0	**8750**	**9016**
2040	5423	896	2626	12	631	75	24	2	0	0	0	0	0	0	0	**9690**	**10059**
2041	5938	997	2920	13	753	85	27	2	0	0	0	0	0	0	0	**10736**	**11233**
2042	6502	1108	3247	15	898	97	30	3	0	0	0	0	0	0	0	**11901**	**12553**
2043	7119	1233	3611	16	1071	111	34	3	0	1	0	0	0	0	0	**13199**	**14040**
2044	7795	1371	4016	18	1278	127	38	3	0	1	0	0	0	0	0	**14646**	**15717**
2045	8535	1525	4466	20	1524	145	43	4	0	1	0	0	0	0	0	**16261**	**17611**
2046	9345	1696	4966	21	1818	166	48	4	0	1	0	0	0	0	0	**18065**	**19753**
2047	10232	1886	5523	24	2168	190	54	4	0	1	0	0	0	0	0	**20081**	**22177**

YEAR	Motorised Vehicles										Non-Motorised Vehicles				Total Vehicles	Total PCUs
	Two Wheelers	Auto Rickshaw	Car/Jeep/ Van/Taxi	Mini Bus	Standard Bus	LCV	2-Axle Trucks	3-Axle Trucks	Multi Axle Trucks	Tractor with Trailer	Tractor without Trailer	Cycles	Bullock Carts	Horse Carts	Hand Drawn Vehicles		
2048	11204	2097	6142	26	2586	216	61	5	0	1	0	0	0	0	0	**22338**	**24924**
2049	12267	2333	6830	29	3085	247	68	5	0	1	0	0	0	0	0	**24864**	**28042**
2050	13432	2594	7595	32	3679	283	76	6	0	1	0	0	0	0	0	**27697**	**31587**
2051	14707	2885	8446	35	4388	323	86	7	0	1	0	0	0	0	0	**30877**	**35620**

2.8 Capacity Analysis and Lane Requirement between Minerva Junction and Hudson Circle

- As per the road inventory it is observed that, the JC road is having a varying carriageway width between three to four lane configurations.
- Basically, the new urban roads will be designed for Level of Service C (LOS C). As per IRC-106-1990, the capacity of 2-lane (one-way) is 2400PCU/hour.
- Since the traffic on the JC road is one-way and width of carriageway is almost 3 to 4-lane configurations from Minerva Junction to Town Hall Junction and Badami House Junction to Hudson Circle, therefore, the capacity of 3-lane (one-way) shall be 3600PCU/hour as per IRC-106-1990.
- Similarly, width of carriageway is 2-lane configurations from Town Hall Junction to Badami House Junction, the capacity of 2-lane (one-way) shall be 2700PCU/hour as per IRC-92-2017
- The traffic projections with growth rate as per econometric method are presented in Table 2.-50 to Table 2-53

As per cl B.2.1.4, IRC 108-2015, Normally, for a congested road (with high volume to capacity ratio) the traffic growth is expected to be lower. So, in most cases, lower growths may be reasonable till the capacity augmentation is done. Even after capacity augmentation, traffic growths are unlikely to be uniform during the entire design period. The growths are expected to be higher in the initial periods after road widening/improvement, and will become lower thereafter because of increasing traffic volume and reduced attractiveness of the road (i.e. more volume, less freedom of movement, more congestion, more travel time, etc.).

The present corridor is one such road where the existing road is very congested with volume to capacity ratios varying from 1.83 to 2.96 indicating complete saturation. One more observation while collecting the data it is found through the commuters along the corridor, that the travel time along the corridor is not changed much from past several years indicating that the traffic growth along the corridor is not much and situation is similar to the statement of cl B2.1.4,IRC:108-2015. Considering the fact that the lane requirement as per traffic projection to restrict the v/c ratio is highly impractical/unrealistic and considering the site constraints it necessary to augment the capacity to the extent possible. Presently, speed of vehicles along the corridor is about 10 to 15 Kmph and without the facility, with the increase in the traffic, it is expected that the speed of vehicles along the corridor will further reduce resulting in increase of travelling time, Q length at the signal resulting in multiple signal cycles with overall delay for the road user.

The present situation is to be improved w,r,t capacity and travel time. Accordingly, 4 lane bidirectional elevated road with improvement at grade level along JC road is proposed in discussion with the authority.

Assuming Level of Service LOS-C and as per IRC guidelines, the Volume to Capacity Ratio between Minerva Junction and Hudson Circle is presented below for both conditions i.e. **Prior to implementation** of elevated road and **Post Implementation** of Elevated Road for the At-Grade Road (JC Road from Minerva Junction to Hudson Circle

2.9 Elevated Rotary at Hudson circle

To facilitate the smooth movement of traffic at Hudson church junction elevated rotary is proposed along the circumference of Hudson church. The geometry of elevated rotary is proposed as per the guidelines of IRC:65. The traffic on elevated rotary will be from Minerva circle will go towards KG road and remaining traffic will move further up to Kasturba road. The traffic from Nrupathunga road which go towards JC road, will join the traffic and traffic from JC road towards Kasthur bah road will take Kasthur Bah road ramp.

The Design of rotary is carried out as per the guidelines of IRC:65 and details are furnished below-

1. Radius of Curve at Entry and Exit
2. Radius of Central Island
3. Width of Circulatory carriage way
4. Width of Carriageway at Entry and Exit

1.Radius of Curve at Entry and Exit

a). Radius of Curve at Entry

As per table 6.3, IRC: 65-2017, minimum radius at entry/exit shall be between 30m-75m for 4 lane divided road. Radius provided for all the arms are more than 30m.

2. Inscribed Circle diameter/Radius of central Island

Table 6.1 Inscribed Circle Diameter & Circulatory Carriageway Width

Category of Roundabout/Rotaries	Inscribed circle diameter range in m (ICD)	Width of Circulatory Carriageway (CCW), in m
Urban single lane Roundabout	28 – 40	12 m to 8 m
Rural single lane Roundabout	35 – 40	
Urban/Rural double lane Roundabout	40 – 70	1-1.2 times entry width
Multilane Rotary	>70	

As per table 6.1, IRC: 65 2017, inscribed circle diameter corresponding to double lane round about is 116m, radius = 58m

3. Width of Circulatory carriageway (CCW)

As per table 6.1, width of circulatory carriage way varies from 1 to 1.2 times entry width.

Width of entry = 7.5m

CCW required = 1.2 * 7 = 8.4m

Provide CCW of 11 m >8.4m

4. Width of Carriageway at Entry and Exit

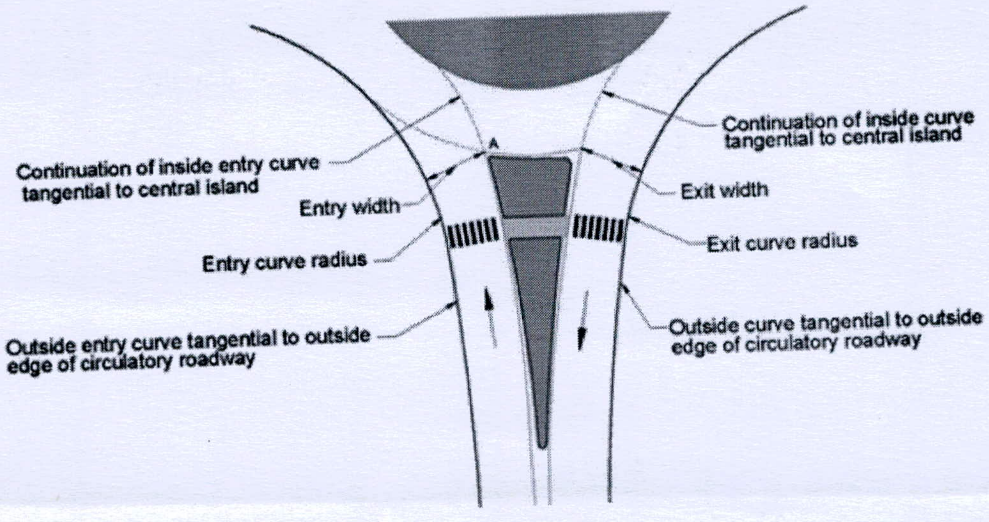

Continuation of inside entry curve tangential to central island
Entry width
Entry curve radius
Outside entry curve tangential to outside edge of circulatory roadway
A
Continuation of inside curve tangential to central island
Exit width
Exit curve radius
Outside curve tangential to outside edge of circulatory roadway

Fig. 6.1 Radius of Entry and Exit Curve

Entry and Exit Details:

Radius of entry and exit curve > 30m on all arms (As per table 6.3)

Width of carriage way at entry and exit – 7.5m (As per table 6.3)

Weaving width:

Weaving width in rotary = Width of carriageway at entry + one lane width

Width of carriageway at entry/ exit = 7.5m

Width of the weaving section = 7.5 + 3.5 = 11m

Capacity of Rotary

Capacity of rotary is carried out as per the guidelines of IRC:65, considering weaving and non-weaving traffic at various sections, capacity and present traffic is tabulated below;

Section	**Section**	**Present traffic (PCU)**	**Capacity**
1	Between JC Road arm and K.G Road arm	2434	4044
2	Between Nrupathunga road arm and Kastuba road arm	1509	3926
3	Between RRMR road arm to JC Road arm	1651	4101

The capacity of rotary is sufficient for the present day traffic. considering 5% growth rate as a guidance value , traffic on rotary is projected. Accordingly, section 1 reaches its capacity by 2033, section 2 in the year 2043 and section 3 in the year 2037 However, for arm 1, traffic can be controlled by proper traffic management originating from RRMR road once it reaches its capacity. The Capacity Calculation is presented in Annexure -1.

3.0 Conclusions

Detailed Traffic Survey has been undertaken for the project stretch from Minerva Junction to Hudson Circle. Following are the Conclusions based on various outcome from data analysis.

- Morning Peak and Evening Peak Hour Traffic at all **7 Junctions** have resulted in more than 10,000 PCU per hour. Therefore, as per the guidelines stipulated under Section 4.5 of IRC-92-2017, all these junction locations **Warrant for Grade Separators.**

- All these junctions along JC Road from Minerva Junction to Hudson Circle are closely located, hence providing individual grade separator for each junction does not yield greater relief for the at grade traffic. Therefore, it is proposed to provide **Elevated Corridor** from **Minerva Junction to Hudson Circle**.

- As per the analysis, it is observed that major composition of traffic are 2-Wheelers followed by Four Wheelers and then Autos. The composition of Buses and goods vehicles are less in percentage.

- As per the sample O-D analysis at Minerva Junction, Influence factors accounts to 40% for the Zones located beyond Hudson Circle indicating the through traffic. Hence, the same percentage has been considered in estimating through traffic from RV Road and Sajjana Rao Circle road.

- Similarly, the O-D analysis at Minerva Junction, Influence factors accounts to 45% for the Zones located beyond Minerva Junction indicating the through traffic. Hence, the same percentage has been considered in estimating through traffic from Nrupathunga Road and Raja Ram Mohan Roy Road entering Krumbigal (Lalbagh) Road.

- The present data analysis, indicates that around **2753 PCU per Hour** will use the proposed **Elevated Road from Minerva Junction to Hudson Circle direction** and **1527 PCU per Hour** will use the **Elevated Road in Hudson Circle to Minerva Junction direction**.

- Based on the above estimated traffic, the minimum lane requirement in each direction for the current traffic is ***2-Lanes in Minerva Junction to Hudson Circle Direction*** and 2-

Lanes in Hudson Circle to Minerva Junction Direction. Considering the site constraints w.r.t available right of way, and to improve the present traffic flow condition, 4 lane elevated road is proposed considering present traffic.

- Based on the analysis, the congestion levels along the project corridor for different sections indicates that, there is a considerable reduction in the congestion. Due to the proposed elevated corridor, the traffic at the ground level as well as on the elevated road are benefitted due to the reduction in the congestion effect.

- Based on the traffic analysis, it is evident that the Percentage of Relief for At Grade Traffic due to Elevated Road is in the range of 38% to 56% for different sections between Minerva Junction to Hudson Circle for the at grade traffic. The following are the benefits expected from the elevated road.

  a. Reduction in the congestion level there by saving the Road User Cost.

  b. Savings in the Road user cost for vehicles at junctions due to removal of major volume of traffic getting conflicted with turning traffic at all junctions.

  c. Similarly, the traffic using Elevated Road will save substantially due to free flow movement from start to end of the corridor.

  - With the implementation of Metro phase 3A by M/s BMRCL it is expected that there will be further reduction of traffic of private vehicle along the corridor. Also, to further reduce/decongest the traffic along JC Road, various traffic rules may be planned in consultation with Traffic department to ensure comparatively smoother traffic flow along the corridor.

  - By providing Elevated rotary with a diameter of 116m, at Hudson circle, turning traffic, merging traffic at the junction is smoothened

All the above benefits make the project viable.

Based on the detailed analysis of data and its outcome, it is recommended to propose a 4-lnae divided Elevated Road between Minerva Junction and Hudson Circle to facilitate two-way traffic movement to provide relief to At-Grade Road along the corridor especially for JC road.

Traffic study
JC Rd Flyover

Traffic Study (August 22) for
Flyover on JC Road from
Minerva Junction to Hudson Circle